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WHAT IS CLAIMED IS:

1. A human interleukin-3 mutant polypeptide Formula I:

Ala Pro Met Thr Gln Thr Thr Ser Leu Lys Thr Ser Trp Val Asn
1   5   10   15

Cys Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        20 25   30

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Xaa Xaa Xaa Xaa Xaa Xaa
        35 40   45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        50 55   60

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        65 70   75

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        80 85   90

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        95 100   105

Xaa Phe Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        110 115   120

Xaa Xaa Xaa Gln Gln Thr Thr Leu Ser Leu Ala Ile Phe [SEQ ID
        125 130

NO:15]

wherein Xaa at position 17 is Ser, Lys, Gly, Asp, Met, Gln, or
        Arg;
Xaa at position 18 is Asn, His, Leu, Ile, Phe, Arg, or Gln;

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Xaa at position 19 is Met, Phe, Ile, Arg, Gly, Ala, or Cys;

Xaa at position 20 is Ile, Cys, Gln, Glu, Arg, Pro, or Ala;

Xaa at position 21 is Asp, Phe, Lys, Arg, Ala, Gly, Glu, Gln, Asn, Thr, Ser or

5   Val;

Xaa at position 22 is Glu, Trp, Pro, Ser, Ala, His, Asp, Asn, Gln, Leu, Val or

        Gly;

Xaa at position 23 is Ile, Val, Ala, Leu, Gly, Trp, Lys, Phe,

10   Leu, Ser, or Arg;

Xaa at position 24 is Ile, Gly, Val, Arg, Ser, Phe, or Leu;

Xaa at position 25 is Thr, His, Gly, Gln, Arg, Pro, or Ala;

Xaa at position 26 is His, Thr, Phe, Gly, Arg, Ala, or Trp;

Xaa at position 27 is Leu, Gly, Arg, Thr, Ser, or Ala;

15 Xaa at position 28 is Lys, Arg, Leu, Gln, Gly, Pro, Val or Trp;

Xaa at position 29 is Gln, Asn, Leu, Pro, Arg, or Val;

Xaa at position 30 is Pro, His, Thr, Gly, Asp, Gln, Ser, Leu, or

        Lys;

Xaa at position 31 is Pro, Asp, Gly, Ala, Arg, Leu, or Gln;

20 Xaa at position 32 is Leu, Val, Arg, Gln, Asn, Gly, Ala, or Glu;

Xaa at position 33 is Pro, Leu, Gln, Ala, Thr, or Glu;

Xaa at position 34 is Leu, Val, Gly, Ser, Lys, Glu, Gln, Thr, Arg, Ala, Phe,

        Ile or Met;

25 Xaa at position 35 is Leu, Ala, Gly, Asn, Pro, Gln, or Val;

Xaa at position 36 is Asp, Leu, or Val;

Xaa at position 37 is Phe, Ser, Pro, Trp, or Ile;

Xaa at position 38 is Asn, or Ala;

Xaa at position 40 is Leu, Trp, or Arg;

30 Xaa at position 41 is Asn, Cys, Arg, Leu, His, Met, or Pro;

Xaa at position 42 is Gly, Asp, Ser, Cys, Asn, Lys, Thr, Leu, Val, Glu, Phe,

        Tyr, Ile, Met or Ala;

Xaa at position 43 is Glu, Asn, Tyr, Leu, Phe, Asp, Ala, Cys,

35 Gln, Arg, Thr,

        Gly or Ser;

Xaa at position 44 is Asp, Ser, Leu, Arg, Lys, Thr, Met, Trp, Glu, Asn, Gln,

Ala or Pro;

Xaa at position 45 is Gln, Pro, Phe, Val, Met, Leu, Thr, Lys, Trp, Asp, Asn,

Arg, Ser, Ala, Ile, Glu or His;

Xaa at position 46 is Asp, Phe, Ser, Thr, Cys, Glu, Asn, Gln, Lys, His, Ala,

Tyr, Ile, Val or Gly;

Xaa at position 47 is Ile, Gly, Val, Ser, Arg, Pro, or His;

Xaa at position 48 is Leu, Ser, Cys, Arg, Ile, His, Phe, Glu, Lys, Thr, Ala,

Met, Val or Asn;

Xaa at position 49 is Met, Arg, Ala, Gly, Pro, Asn, His, or Asp;

Xaa at position 50 is Glu, Leu, Thr, Asp, Tyr, Lys, Asn, Ser, Ala, Ile, Val,

His, Phe, Met or Gln;

Xaa at position 51 is Asn, Arg, Met, Pro, Ser, Thr, or His;

Xaa at position 52 is Asn, His, Arg, Leu, Gly, Ser, or Thr;

Xaa at position 53 is Leu, Thr, Ala, Gly, Glu, Pro, Lys, Ser, or Met;

Xaa at position 54 is Arg, Asp, Ile, Ser, Val, Thr, Gln, Asn, Lys,

His, Ala or Leu;

Xaa at position 55 is Arg, Thr, Val, Ser, Leu, or Gly;

Xaa at position 56 is Pro, Gly, Cys, Ser, Gln, Glu, Arg, His, Thr, Ala, Tyr, Phe, Leu, Val or Lys;

Xaa at position 57 is Asn or Gly;

Xaa at position 58 is Leu, Ser, Asp, Arg, Gln, Val, or Cys;

Xaa at position 59 is Glu Tyr, His, Leu, Pro, or Arg;

Xaa at position 60 is Ala, Ser, Pro, Tyr, Asn, or Thr;

Xaa at position 61 is Phe, Asn, Glu, Pro, Lys, Arg, or Ser;

Xaa at position 62 is Asn His, Val, Arg, Pro, Thr, Asp, or Ile;

Xaa at position 63 is Arg, Tyr, Trp, Lys, Ser, His, Pro, or Val;

Xaa at position 64 is Ala, Asn, Pro, Ser, or Lys;

Xaa at position 65 is Val, Thr, Pro, His, Leu, Phe, or Ser;

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Xaa at position 66 is Lys, Ile, Arg, Val, Asn, Glu, or Ser;

Xaa at position 67 is Ser, Ala, Phe, Val, Gly, Asn, Ile, Pro, or

His;

Xaa at position 68 is Leu, Val, Trp, Ser, Ile, Phe, Thr, or His;

5   Xaa at position 69 is Gln, Ala, Pro, Thr, Glu, Arg, Trp, Gly, or

Leu;

Xaa at position 70 is Asn, Leu, Val, Trp, Pro, or Ala;

Xaa at position 71 is Ala, Met, Leu, Pro, Arg, Glu, Thr, Gln,

Trp, or Asn;

10   Xaa at position 72 is Ser, Glu, Met, Ala, His, Asn, Arg, or Asp;

Xaa at position 73 is Ala, Glu, Asp, Leu, Ser, Gly, Thr, or Arg;

Xaa at position 74 is Ile, Met, Thr, Pro, Arg, Gly, Ala;

Xaa at position 75 is Glu, Lys, Gly, Asp, Pro, Trp, Arg, Ser,

Gln, or Leu;

15   Xaa at position 76 is Ser, Val, Ala, Asn, Trp, Glu, Pro, Gly, or

Asp;

Xaa at position 77 is Ile, Ser, Arg, Thr, or Leu;

Xaa at position 78 is Leu, Ala, Ser, Glu, Phe, Gly, or Arg;

Xaa at position 79 is Lys, Thr, Asn, Met, Arg, Ile, Gly, or

20   Asp;

Xaa at position 80 is Asn, Trp, Val, Gly, Thr, Leu, Glu, or Arg;

Xaa at position 81 is Leu, Gln, Gly, Ala, Trp, Arg, Val, or Lys;

Xaa at position 82 is Leu, Gln, Lys, Trp, Arg, Asp, Glu, Asn,

His,

25   Thr, Ser, Ala, Tyr, Phe, Ile, Met or Val;

Xaa at position 83 is Pro, Ala, Thr, Trp, Arg, or Met;

Xaa at position 84 is Cys, Glu, Gly, Arg, Met, or Val;

Xaa at position 85 is Leu, Asn, Val, or Gln;

Xaa at position 86 is Pro, Cys, Arg, Ala, or Lys;

30   Xaa at position 87 is Leu, Ser, Trp, or Gly;

Xaa at position 88 is Ala, Lys, Arg, Val, or Trp;

Xaa at position 89 is Thr, Asp, Cys, Leu, Val, Glu, His, Asn, or

Ser;

Xaa at position 90 is Ala, Pro, Ser, Thr, Gly, Asp, Ile, or Met;

35   Xaa at position 91 is Ala, Pro, Ser, Thr, Phe, Leu, Asp, or His;

Xaa at position 92 is Pro, Phe, Arg, Ser, Lys, His, Ala, Gly, Ile

or Leu;

Xaa at position 93 is Thr, Asp, Ser, Asn, Pro, Ala, Leu, or Arg;

Xaa at position 94 is Arg, Ile, Ser, Glu, Leu, Val, Gln, Lys, His, Ala, or

5   Pro;

Xaa at position 95 is His, Gln, Pro, Arg, Val, Leu, Gly, Thr, Asn, Lys, Ser,

      Ala, Trp, Phe, Ile, or Tyr;

Xaa at position 96 is Pro, Lys, Tyr, Gly, Ile, or Thr;

10   Xaa at position 97 is Ile, Val, Lys, Ala, or Asn;

Xaa at position 98 is His, Ile, Asn, Leu, Asp, Ala, Thr,

      Glu, Gln, Ser, Phe, Met, Val, Lys, Arg, Tyr or Pro;

Xaa at position 99 is Ile, Leu, Arg, Asp, Val, Pro, Gln,

      Gly, Ser, Phe, or His;

15   Xaa at position 100 is Lys, Tyr, Leu, His, Arg, Ile, Ser, Gln,

      or Pro;

Xaa at position 101 is Asp, Pro, Met, Lys, His, Thr, Val,

      Tyr, Glu, Asn, Ser, Ala, Gly, Ile, Leu, or Gln;

Xaa at position 102 is Gly, Leu, Glu, Lys, Ser, Tyr, or Pro;

20   Xaa at position 103 is Asp, or Ser;

Xaa at position 104 is Trp, Val, Cys, Tyr, Thr, Met, Pro, Leu,

      Gln, Lys, Ala, Phe, or Gly;

Xaa at position 105 is Asn, Pro, Ala, Phe, Ser, Trp, Gln, Tyr,

      Leu, Lys, Ile, Asp, or His;

25   Xaa at position 106 is Glu, Ser, Ala, Lys, Thr, Ile, Gly, or Pro;

Xaa at position 108 is Arg, Lys, Asp, Leu, Thr, Ile, Gln, His, Ser, Ala or

      Pro;

Xaa at position 109 is Arg, Thr, Pro, Glu, Tyr, Leu, Ser, or Gly;

30   Xaa at position 110 is Lys, Ala, Asn, Thr, Leu, Arg, Gln, His, Glu, Ser, Ala,

      or Trp;

Xaa at position 111 is Leu, Ile, Arg, Asp, or Met;

Xaa at position 112 is Thr, Val, Gln, Tyr, Glu, His, Ser, or Phe;

35   Xaa at position 113 is Phe, Ser, Cys, His, Gly, Trp, Tyr, Asp,

      Lys, Leu, Ile, Val or Asn;

Xaa at position 114 is Tyr, Cys, His, Ser, Trp, Arg, or Leu;

Xaa at position 115 is Leu, Asn, Val, Pro, Arg, Ala, His, Thr,

Trp, or Met;

Xaa at position 116 is Lys, Leu, Pro, Thr, Met, Asp, Val, Glu,

5   Arg, Trp, Ser, Asn, His, Ala, Tyr, Phe, Gln, or Ile;

Xaa at position 117 is Thr, Ser, Asn, Ile, Trp, Lys, or Pro;

Xaa at position 118 is Leu, Ser, Pro, Ala, Glu, Cys, Asp, or Tyr;

Xaa at position 119 is Glu, Ser, Lys, Pro, Leu, Thr, Tyr, or Arg;

Xaa at position 120 is Asn, Ala, Pro, Leu, His, Val, or Gln;

10   Xaa at position 121 is Ala, Ser, Ile, Asn, Pro, Lys, Asp, or

Gly;

Xaa at position 122 is Gln, Ser, Met, Trp, Arg, Phe, Pro, His,

Ile, Tyr, or Cys;

Xaa at position 123 is Ala, Met, Glu, His, Ser, Pro, Tyr, or Leu;

15

and which can additionally have Met- preceding the amino acid in

position 1; and wherein from 1 to 14 amino acids can be deleted

from the N-terminus and/or from 1 to 15 amino acids can be

deleted from the C-terminus; and wherein from 4 to 44 of the

20   amino acids designated by Xaa are different from the

corresponding amino acids of native (1-133) human interleukin-3.

2.   A human interleukin-3 mutant polypeptide of the

25   Formula II:

Ala Pro Met Thr Gln Thr Thr Ser Leu Lys Thr Ser Trp Val Asn
 1   5   10   15

30   Cys Xaa Xaa Xaa Xaa Xaa Glu Xaa Xaa Xaa Xaa Leu Xaa Xaa Xaa
            20 25   30

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Leu Xaa Xaa Glu Xaa Xaa
        35 40   45

35

Xaa Xaa Leu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Leu Xaa Xaa

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                   50    55                  60

     Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
                   65    70                  75
 5
     Xaa Xaa Leu Xaa Xaa Xaa Xaa Xaa Cys Xaa Pro Xaa Xaa Xaa Xaa
                   80    85                  90


     Xaa Xaa Xaa Arg Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asp Xaa Xaa
10                 95   100                 105


     Xaa Phe Xaa Xaa Lys Leu Xaa Phe Xaa Xaa Xaa Xaa Leu Xaa Xaa
                  110   115                 120

     Xaa Xaa Xaa Gln Gln Thr Thr Leu Ser Leu Ala Ile Phe [SEQ ID
15   NO:16]
                  125   130
```

     wherein

     Xaa at position 17 is Ser, Gly, Asp, Met, or Gln;
20   Xaa at position 18 is Asn, His, Leu, Ile, Phe, Arg, or Gln;
     Xaa at position 19 is Met, Phe, Ile, Arg, or Ala;
     Xaa at position 20 is Ile or Pro;
     Xaa at position 21 is Asp or Glu;
     Xaa at position 23 is Ile, Val, Ala, Leu, or Gly;
25   Xaa at position 24 is Ile, Val, Phe, or Leu;
     Xaa at position 25 is Thr, His, Gly, Gln, Arg, Pro, or Ala;
     Xaa at position 26 is His, Phe, Gly, Arg, or Ala;
     Xaa at position 28 is Lys, Leu, Gln, Gly, Pro, or Val;
     Xaa at position 29 is Gln, Asn, Leu, Arg, or Val;
30   Xaa at position 30 is Pro, His, Thr, Gly, or Gln;
     Xaa at position 31 is Pro, Asp, Gly, Ala, Arg, Leu, or Gln;
     Xaa at position 32 is Leu, Arg, Gln, Asn, Gly, Ala, or Glu;
     Xaa at position 33 is Pro, Leu, Gln, Ala, or Glu;
     Xaa at position 34 is Leu, Val, Gly, Ser, Lys, Ala, Arg, Gln,
35   Glu,
          Ile, Phe, Thr or Met;

Xaa at position 35 is Leu, Ala, Asn, Pro, Gln, or Val;

Xaa at position 36 is Asp or Leu;

Xaa at position 37 is Phe, Ser, Pro, Trp, or Ile;

Xaa at position 38 is Asn or Ala;

Xaa at position 41 is Asn, Cys, Arg, His, Met, or Pro;

Xaa at position 42 is Gly, Asp, Ser, Cys, Ala, Asn, Ile, Leu, Met,

Tyr, Val or Arg;

Xaa at position 44 is Asp or Glu;

Xaa at position 45 is Gln, Val, Met, Leu, Thr, Lys, Ala, Asn, Glu,

Ser, or Trp;

Xaa at position 46 is Asp, Phe, Ser, Thr, Cys, Ala, Asn, Gln, Glu,

His, Ile, Lys, Tyr, Val or Gly;

Xaa at position 47 is Ile, Val, or His;

Xaa at position 49 is Met, Asn, or Asp;

Xaa at position 50 is Glu, Thr, Ala, Asn, Ser or Asp;

Xaa at position 51 is Asn, Arg, Met, Pro, Ser, Thr, or His;

Xaa at position 52 is Asn or Gly;

Xaa at position 53 is Leu, Met, or Phe;

Xaa at position 54 is Arg, Ala, or Ser;

Xaa at position 55 is Arg, Thr, Val, Leu, or Gly;

Xaa at position 56 is Pro, Gly, Cys, Ser, Gln, Ala, Arg, Asn, Glu, His, Leu,

Thr, Val or Lys;

Xaa at position 59 is Glu, Tyr, His, Leu, or Arg;

Xaa at position 60 is Ala, Ser, Asn, or Thr;

Xaa at position 61 is Phe or Ser;

Xaa at position 62 is Asn, Val, Pro, Thr, or Ile;

Xaa at position 63 is Arg, Tyr, Lys, Ser, His, or Val;

Xaa at position 64 is Ala or Asn;

Xaa at position 65 is Val, Thr, Leu, or Ser;

Xaa at position 66 is Lys, Ile, Arg, Val, Asn, Glu, or Ser;

Xaa at position 67 is Ser, Phe, Val, Gly, Asn, Ile, or His;

Xaa at position 68 is Leu, Val, Ile, Phe, or His;

Xaa at position 69 is Gln, Ala, Pro, Thr, Glu, Arg, or Gly;

Xaa at position 70 is Asn or Pro;

Xaa at position 71 is Ala, Met, Pro, Arg, Glu, Thr, or Gln;

Xaa at position 72 is Ser, Glu, Met, Ala, His, Asn, Arg, or Asp;

5   Xaa at position 73 is Ala, Glu, Asp, Leu, Ser, Gly, Thr, Arg, or

Pro;

Xaa at position 74 is Ile or Met;

Xaa at position 75 is Glu, Gly, Asp, Ser, or Gln;

Xaa at position 76 is Ser, Val, Ala, Asn, Glu, Pro, Gly, or

10   Asp;

Xaa at position 77 is Ile, Ser, or Leu;

Xaa at position 79 is Lys, Thr, Gly, Asn, Met, Arg, Ile, Gly, or

Asp;

Xaa at position 80 is Asn, Val, Gly, Thr, Leu, Glu, or Arg;

15   Xaa at position 81 is Leu, or Val;

Xaa at position 82 is Leu, Gln, Trp, Arg, Asp, Ala, Asn, Glu,

His,

Met, Phe, Ser, Thr, Tyr or Val;

Xaa at position 83 is Pro, Ala, Thr, Trp, or Met;

20   Xaa at position 85 is Leu or Val;

Xaa at position 87 is Leu or Ser;

Xaa at position 88 is Ala, Arg, or Trp;

Xaa at position 89 is Thr, Asp, Glu, His, Asn, or Ser;

Xaa at position 90 is Ala, Asp, or Met;

25   Xaa at position 91 is Ala, Pro, Ser, Thr, Phe, Leu, or Asp;

Xaa at position 92 is Pro or Ser;

Xaa at position 93 is Thr, Asp, Ser, Pro, Ala, Leu, or Arg;

Xaa at position 95 is His, Pro, Arg, Val, Leu, Gly, Asn, Ile,

Phe,

30   Ser or Thr;

Xaa at position 96 is Pro or Tyr;

Xaa at position 97 is Ile, Val, or Ala;

Xaa at position 98 is His, Ile, Asn, Leu, Asp, Ala, Thr, Leu,

Arg, Gln, Glu,

35   Lys, Met, Ser, Tyr, Val or Pro;

Xaa at position 99 is Ile, Leu, Val, or Phe;

Xaa at position 100 is Lys, Leu, His, Arg, Ile, Gln, Pro, or
        Ser;

Xaa at position 101 is Asp, Pro, Met, Lys, His, Thr, Val,
        Asn, Ile, Leu or Tyr;

5   Xaa at position 102 is Gly, Glu, Lys, or Ser;

Xaa at position 104 is Trp, Val, Tyr, Met, or Leu;

Xaa at position 105 is Asn, Pro, Ala, Phe, Ser, Trp, Gln, Tyr,
        Leu, Lys, Ile, Asp, or His;

Xaa at position 106 is Glu, Ser, Ala, or Gly;

10 Xaa at position 108 is Arg, Ala, Gln, Ser or Lys;

Xaa at position 109 is Arg, Thr, Glu, Leu, Ser, or Gly;

Xaa at position 112 is Thr, Val, Gln, Glu, His, or Ser;

Xaa at position 114 is Tyr or Trp;

Xaa at position 115 is Leu or Ala;

15 Xaa at position 116 is Lys, Thr, Met, Val, Trp, Ser, Leu, Ala,
Asn,
        Gln, His, Met, Phe, Tyr or Ile;

Xaa at position 117 is Thr, Ser, or Asn;

Xaa at position 119 is Glu, Ser, Pro, Leu, Thr, or Tyr;

20 Xaa at position 120 is Asn, Pro, Leu, His, Val, or Gln;

Xaa at position 121 is Ala, Ser, Ile, Asn, Pro, Lys, Asp, or
        Gly;

Xaa at position 122 is Gln, Ser, Met, Trp, Arg, Phe, Pro, His,
        Ile, Tyr, or Cys;

25 Xaa at position 123 is Ala, Met, Glu, His, Ser, Pro, Tyr, or Leu;

and which can additionally have Met- preceding the amino acid in

position 1; and wherein from 1 to 14 amino acids can be deleted

from the N-terminus and/or from 1 to 15 amino acids can be

30 deleted from the C-terminus; and wherein from 4 to 44 of the

amino acids designated by Xaa are different from the

corresponding amino acids of native (1-133) human interleukin-3.

    3.   A human interleukin-3 mutant polypeptide

35 according to claim 2 of the Formula III:

```
     Ala Pro Met Thr Gln Thr Thr Ser Leu Lys Thr Ser Trp Val Asn
     1           5   10                  15
```

```
5    Cys Xaa Xaa Xaa Ile Xaa Glu Xaa Xaa Xaa Xaa Leu Lys Xaa Xaa
                     20  25                  30
```

```
     Xaa Xaa Xaa Xaa Xaa Asp Xaa Xaa Asn Leu Asn Xaa Glu Xaa Xaa
                 35  40                  45
```

```
10   Xaa Ile Leu Met Xaa Xaa Asn Leu Xaa Xaa Xaa Asn Leu Glu Xaa
                 50  55                  60
```

```
     Phe Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Xaa Xaa Xaa Ile Glu
                 65  70                  75
```

```
15   Xaa Xaa Leu Xaa Xaa Leu Xaa Xaa Cys Xaa Pro Xaa Xaa Thr Ala
                 80  85                  90
```

```
     Xaa Pro Xaa Arg Xaa Xaa Xaa Xaa Xaa Xaa Xaa Gly Asp Xaa Xaa
20               95  100                 105
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```
     Xaa Phe Xaa Xaa Lys Leu Xaa Phe Xaa Xaa Xaa Xaa Leu Glu Xaa
                 110 115                 120
```

```
25   Xaa Xaa Xaa Gln Gln Thr Thr Leu Ser Leu Ala Ile Phe [SEQ ID
     NO:17]
                 125 130
```

```
     wherein
30   Xaa at position 17 is Ser, Gly, Asp, Met, or Gln;
     Xaa at position 18 is Asn, His, or Ile;
     Xaa at position 19 is Met or Ile;
     Xaa at position 21 is Asp or Glu;
     Xaa at position 23 is Ile, Ala, Leu, or Gly;
35   Xaa at position 24 is Ile, Val, or Leu;
     Xaa at position 25 is Thr, His, Gln, or Ala;
```

Xaa at position 26 is His or Ala;

Xaa at position 29 is Gln, Asn, or Val;

Xaa at position 30 is Pro, Gly, or Gln;

Xaa at position 31 is Pro, Asp, Gly, or Gln;

5   Xaa at position 32 is Leu, Arg, Gln, Asn, Gly, Ala, or Glu;

Xaa at position 33 is Pro or Glu;

Xaa at position 34 is Leu, Val, Gly, Ser, Lys, Ala, Arg, Gln,

Glu, Ile, Phe, Thr or Met;

Xaa at position 35 is Leu, Ala, Asn, Pro, Gln, or Val;

10   Xaa at position 37 is Phe, Ser, Pro, or Trp;

Xaa at position 38 is Asn or Ala;

Xaa at position 42 is Gly, Asp, Ser, Cys, Ala, Asn, Ile, Leu,

Met, Tyr or Arg;

Xaa at position 44 is Asp or Glu;

15   Xaa at position 45 is Gln, Val, Met, Leu, Thr, Ala, Asn, Glu,

Ser or Lys;

Xaa at position 46 is Asp, Phe, Ser, Thr, Ala, Asn Gln, Glu, His,

Ile, Lys, Tyr, Val or Cys;

Xaa at position 50 is Glu, Ala, Asn, Ser or Asp;

20   Xaa at position 51 is Asn, Arg, Met, Pro, Ser, Thr, or His;

Xaa at position 54 is Arg or Ala;

Xaa at position 55 is Arg, Thr, Val, Leu, or Gly;

Xaa at position 56 is Pro, Gly, Ser, Gln, Ala, Arg, Asn, Glu,

Leu, Thr, Val or Lys;

25   Xaa at position 60 is Ala or Ser;

Xaa at position 62 is Asn, Pro, Thr, or Ile;

Xaa at position 63 is Arg or Lys;

Xaa at position 64 is Ala or Asn;

Xaa at position 65 is Val or Thr;

30   Xaa at position 66 is Lys or Arg;

Xaa at position 67 is Ser, Phe, or His;

Xaa at position 68 is Leu, Ile, Phe, or His;

Xaa at position 69 is Gln, Ala, Pro, Thr, Glu, Arg, or Gly;

Xaa at position 71 is Ala, Pro, or Arg;

35   Xaa at position 72 is Ser, Glu, Arg, or Asp;

Xaa at position 73 is Ala or Leu;

Xaa at position 76 is Ser, Val, Ala, Asn, Glu, Pro, or Gly;

Xaa at position 77 is Ile or Leu;

Xaa at position 79 is Lys, Thr, Gly, Asn, Met, Arg, Ile, Gly, or

Asp;

5   Xaa at position 80 is Asn, Gly, Glu, or Arg;

Xaa at position 82 is Leu, Gln, Trp, Arg, Asp, Ala, Asn, Glu,

His,

  Ile, Met, Phe, Ser, Thr, Tyr or Val;

Xaa at position 83 is Pro or Thr;

10   Xaa at position 85 is Leu or Val;

Xaa at position 87 is Leu or Ser;

Xaa at position 88 is Ala or Trp;

Xaa at position 91 is Ala or Pro;

Xaa at position 93 is Thr, Asp, Ser, Pro, Ala, Leu, or Arg;

15   Xaa at position 95 is His, Pro, Arg, Val, Leu, Gly, Asn, Phe, Ser

  or Thr;

Xaa at position 96 is Pro or Tyr;

Xaa at position 97 is Ile or Val;

Xaa at position 98 is His, Ile, Asn, Leu, Ala, Thr, Leu, Arg,

20   Gln,

  Leu, Lys, Met, Ser, Tyr, Val or Pro;

Xaa at position 99 is Ile, Leu, or Val;

Xaa at position 100 is Lys, Arg, Ile, Gln, Pro, or Ser;

Xaa at position 101 is Asp, Pro, Met, Lys, His, Thr, Pro, Asn,

25   Ile, Leu or Tyr;

Xaa at position 104 is Trp or Leu;

Xaa at position 105 is Asn, Pro, Ala, Ser, Trp, Gln, Tyr, Leu,

  Lys, Ile, Asp, or His;

Xaa at position 106 is Glu or Gly;

30   Xaa at position 108 is Arg, Ala, or Ser;

Xaa at position 109 is Arg, Thr, Glu, Leu, or Ser;

Xaa at position 112 is Thr, Val, or Gln;

Xaa at position 114 is Tyr or Trp;

Xaa at position 115 is Leu or Ala;

35   Xaa at position 116 is Lys, Thr, Val, Trp, Ser, Ala, His, Met,

  Phe, Tyr or Ile;

Xaa at position 117 is Thr or Ser;

Xaa at position 120 is Asn, Pro, Leu, His, Val, or Gln;

Xaa at position 121 is Ala, Ser, Ile, Asn, Pro, Asp, or Gly;

Xaa at position 122 is Gln, Ser, Met, Trp, Arg, Phe, Pro, His,

5   Ile, Tyr, or Cys;

Xaa at position 123 is Ala, Met, Glu, His, Ser, Pro, Tyr, or Leu;

and which can additionally have Met- preceding the amino acid in

position 1; and wherein from 1 to 14 amino acids can be deleted

10   from the N-terminus and/or from 1 to 15 amino acids can be

deleted from the C-terminus; and wherein from 4 to 35 of the

amino acids designated by Xaa are different from the

corresponding amino acids of native (1-133)human interleukin-3.

15   4.   A human interleukin-3 mutant polypeptide according to

Claim 3 of the Formula IV:

Ala Pro Met Thr Gln Thr Thr Ser Leu Lys Thr Ser Trp Val Asn

 1   5   10   15

20

Cys Xaa Xaa Met Ile Asp Glu Xaa Ile Xaa Xaa Leu Lys Xaa Xaa

           20 25   30

Pro Xaa Pro Xaa Xaa Asp Phe Xaa Asn Leu Asn Xaa Glu Asp Xaa

25   35 40   45

Xaa Ile Leu Met Xaa Xaa Asn Leu Arg Xaa Xaa Asn Leu Glu Ala

               50 55   60

30   Phe Xaa Arg Xaa Xaa Lys Xaa Xaa Xaa Asn Ala Ser Ala Ile Glu

               65 70   75

Xaa Xaa Leu Xaa Xaa Leu Xaa Pro Cys Leu Pro Xaa Xaa Thr Ala

               80 85   90

35

Xaa Pro Xaa Arg Xaa Pro Ile Xaa Xaa Xaa Xaa Gly Asp Trp Xaa

305

                95   100   105

Glu Phe Xaa Xaa Lys Leu Xaa Phe Tyr Leu Xaa Xaa Leu Glu Xaa
            110 115   120

5

Xaa Xaa Xaa Gln Gln Thr Thr Leu Ser Leu Ala Ile Phe [SEQ ID
NO:18]
            125 130

wherein

Xaa at position 17 is Ser, Gly, Asp, or Gln;

Xaa at position 18 is Asn, His, or Ile;

Xaa at position 23 is Ile, Ala, Leu, or Gly;

Xaa at position 25 is Thr, His, or Gln;

Xaa at position 26 is His or Ala;

Xaa at position 29 is Gln or Asn;

Xaa at position 30 is Pro or Gly;

Xaa at position 32 is Leu, Arg, Asn, or Ala;

Xaa at position 34 is Leu, Val, Ser, Ala, Arg, Gln, Glu, Ile,
        Phe, Thr, or Met;

Xaa at position 35 is Leu, Ala, Asn, or Pro;

Xaa at position 38 is Asn or Ala;

Xaa at position 42 is Gly, Asp, Ser, Ala, Asn, Ile, Leu, Met,
        Tyr or Arg;

Xaa at position 45 is Gln, Val, Met, Leu, Ala, Asn, Glu, or Lys;

Xaa at position 46 is Asp, Phe, Ser, Gln, Glu, His, Val
        or Thr;

Xaa at position 50 is Glu Asn, Ser or Asp;

Xaa at position 51 is Asn, Arg, Pro, Thr, or His;

Xaa at position 55 is Arg, Leu, or Gly;

Xaa at position 56 is Pro, Gly, Ser, Ala, Asn, Val, Leu or Gln;

Xaa at position 62 is Asn, Pro, or Thr;

Xaa at position 64 is Ala or Asn;

Xaa at position 65 is Val or Thr;

Xaa at position 67 is Ser or Phe;

Xaa at position 68 is Leu or Phe;

Xaa at position 69 is Gln, Ala, Glu, or Arg;

Xaa at position 76 is Ser, Val, Asn, Pro, or Gly;

Xaa at position 77 is Ile or Leu;

Xaa at position 79 is Lys, Gly, Asn, Met, Arg, Ile, or Gly;

Xaa at position 80 is Asn, Gly, Glu, or Arg;

5 Xaa at position 82 is Leu, Gln, Trp, Arg, Asp, Asn, Glu, His, Met,

       Phe, Ser, Thr, Tyr or Val;

Xaa at position 87 is Leu or Ser;

Xaa at position 88 is Ala or Trp;

10 Xaa at position 91 is Ala or Pro;

Xaa at position 93 is Thr, Asp, or Ala;

Xaa at position 95 is His, Pro, Arg, Val, Gly, Asn, Ser or Thr;

Xaa at position 98 is His, Ile, Asn, Ala, Thr, Gln, Glu,

       Lys, Met, Ser, Tyr, Val or Leu;

15 Xaa at position 99 is Ile or Leu;

Xaa at position 100 is Lys or Arg;

Xaa at position 101 is Asp, Pro, Met, Lys, Thr, His, Pro, Asn, Ile,

       Leu or Tyr;

20 Xaa at position 105 is Asn, Pro, Ser, Ile or Asp;

Xaa at position 108 is Arg, Ala, or Ser;

Xaa at position 109 is Arg, Thr, Glu, Leu, or Ser;

Xaa at position 112 is Thr or Gln;

Xaa at position 116 is Lys, Val, Trp, Ala, His, Phe, Tyr or Ile;

25 Xaa at position 117 is Thr or Ser;

Xaa at position 120 is Asn, Pro, Leu, His, Val, or Gln;

Xaa at position 121 is Ala, Ser, Ile, Pro, or Asp;

Xaa at position 122 is Gln, Met, Trp, Phe, Pro, His, Ile, or Tyr;

Xaa at position 123 is Ala, Met, Glu, Ser, or Leu;

30

and which can additionally have Met- preceding the amino acid in

position 1; and wherein from 1 to 14 amino acids can be deleted

from the N-terminus and/or from 1 to 15 amino acids can be

deleted from the C-terminus; and wherein from 4 to 44 of the

35 amino acids designated by Xaa are different from the

corresponding amino acids of native (1-133)human interleukin-3.

5. The human interleukin-3 mutant polypeptide of claim 1 wherein 1-15 amino acids are deleted from the C-terminus and/or 1-14 amino acids are deleted from the N-terminus.

6. The human interleukin-3 mutant polypeptide of claim 1 wherein;

Xaa at position 42 is Gly, Asp, Ser, Ile, Leu, Met, Tyr, or Ala;

Xaa at position 45 is Gln, Val, Met or Asn;

Xaa at position 46 is Asp, Ser, Gln, His or Val;

Xaa at position 50 is Glu or Asp;

Xaa at position 51 is Asn, Pro or Thr;

Xaa at position 62 is Asn or Pro;

Xaa at position 76 is Ser, or Pro;

Xaa at position 82 is Leu, Trp, Asp, Asn Glu, His, Phe, Ser or Tyr;

Xaa at position 95 is His, Arg, Thr, Asn or Ser;

Xaa at position 98 is His, Ile, Leu, Ala, Gln, Lys, Met, Ser, Tyr or Val;

Xaa at position 100 is Lys or Arg;

Xaa at position 101 is Asp, Pro, His, Asn, Ile or Leu;

Xaa at position 105 is Asn, or Pro;

Xaa at position 108 is Arg, Ala, or Ser;

Xaa at position 116 is Lys, Val, Trp, Ala, His, Phe, or Tyr;

Xaa at position 121 is Ala, or Ile;

Xaa at position 122 is Gln, or Ile; and

Xaa at position 123 is Ala, Met or Glu.

7. A (15-125)human interleukin-3 mutant polypeptide of the Formula V:

Asn Cys Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1   5   10   15

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Xaa Xaa Xaa Xaa Xaa

```
                20    25                    30

    Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
                35    40                    45
5

    Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
                50    55                    60


    Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
10              65    70                    75


    Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
                80    85                    90


15  Xaa Xaa Phe Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
                95   100                   105


    Xaa Xaa Xaa Xaa Gln Gln [SEQ ID NO:19]
                110

20

    wherein
    Xaa at position 3 is Ser, Lys, Gly, Asp, Met, Gln, or Arg;
    Xaa at position 4 is Asn, His, Leu, Ile, Phe, Arg, or Gln;
    Xaa at position 5 is Met, Phe, Ile, Arg, Gly, Ala, or Cys;
25  Xaa at position 6 is Ile, Cys, Gln, Glu, Arg, Pro, or Ala;
    Xaa at position 7 is Asp, Phe, Lys, Arg, Ala, Gly, Glu, Gln, Asn,
            Thr, Ser or Val;
    Xaa at position 8 is Glu, Trp, Pro, Ser, Ala, His, Asp, Asn, Gln,
            Leu, Val, or Gly;
30  Xaa at position 9 is Ile, Val, Ala, Leu, Gly, Trp, Lys, Phe,
            Leu, Ser, or Arg;
    Xaa at position 10 is Ile, Gly, Val, Arg, Ser, Phe, or Leu;
    Xaa at position 11 is Thr, His, Gly, Gln, Arg, Pro, or Ala;
    Xaa at position 12 is His, Thr, Phe, Gly, Arg, Ala, or Trp;
35  Xaa at position 13 is Leu, Gly, Arg, Thr, Ser, or Ala;
    Xaa at position 14 is Lys, Arg, Leu, Gln, Gly, Pro, Val or Trp;
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Xaa at position 15 is Gln, Asn, Leu, Pro, Arg, or Val;

Xaa at position 16 is Pro, His, Thr, Gly, Asp, Gln, Ser, Leu, or
        Lys;

Xaa at position 17 is Pro, Asp, Gly, Ala, Arg, Leu, or Gln;

5   Xaa at position 18 is Leu, Val, Arg, Gln, Asn, Gly, Ala, or Glu;

Xaa at position 19 is Pro, Leu, Gln, Ala, Thr, or Glu;

Xaa at position 20 is Leu, Val, Gly, Ser, Lys, Glu, Gln, Thr,
        Arg, Ala, Phe, Ile or Met;

Xaa at position 21 is Leu, Ala, Gly, Asn, Pro, Gln, or Val;

10   Xaa at position 22 is Asp, Leu, or Val;

Xaa at position 23 is Phe, Ser, Pro, Trp, or Ile;

Xaa at position 24 is Asn, or Ala;

Xaa at position 26 is Leu, Trp, or Arg;

Xaa at position 27 is Asn, Cys, Arg, Leu, His, Met, Pro;

15   Xaa at position 28 is Gly, Asp, Ser, Cys, Ala, Lys, Asn, Thr,
Leu,
        Val, Glu, Phe, Tyr, Ile or Met;

Xaa at position 29 is Glu, Asn, Tyr, Leu, Phe, Asp, Ala, Cys,
Gln,

20   Arg, Thr, Gly or Ser;

Xaa at position 30 is Asp, Ser, Leu, Arg, Lys, Thr,Met, Trp, Glu,
        Asn, Gln, Ala or Pro;

Xaa at position 31 is Gln, Pro, Phe, Val, Met, Leu, Thr, Lys,
Asp,

25   Asn, Arg, Ser, Ala, Ile, Glu, His or Trp;

Xaa at position 32 is Asp, Phe, Ser, Thr, Cys, Glu, Asn, Gln,
        Lys, His, Ala, Tyr, Ile, Val or Gly;

Xaa at position 33 is Ile, Gly, Val, Ser, Arg, Pro, or His;

Xaa at position 34 is Leu, Ser, Cys, Arg, Ile, His, Phe, Glu,

30   Lys, Thr, Ala, Met, Val or Asn;

Xaa at position 35 is Met, Arg, Ala, Gly, Pro, Asn, His, or Asp;

Xaa at position 36 is Glu, Leu, Thr, Asp, Tyr, Lys, Asn, Ser,
Ala,
        Ile, Val, His, Phe, Met or Gln;

35   Xaa at position 37 is Asn, Arg, Met, Pro, Ser, Thr, or His;

Xaa at position 38 is Asn, His, Arg, Leu, Gly, Ser, or Thr;

Xaa at position 39 is Leu, Thr, Ala, Gly, Glu, Pro, Lys, Ser,
        Met, or;

Xaa at position 40 is Arg, Asp, Ile, Ser, Val, Thr, Gln, Asn,
        Lys, His, Ala or Leu;

5   Xaa at position 41 is Arg, Thr, Val, Ser, Leu, or Gly;

Xaa at position 42 is Pro, Gly, Cys, Ser, Gln, Glu, Arg, His,
        Thr, Ala, Tyr, Phe, Leu, Val or Lys;

Xaa at position 43 is Asn or Gly;

Xaa at position 44 is Leu, Ser, Asp, Arg, Gln, Val, or Cys;

10 Xaa at position 45 is Glu Tyr, His, Leu, Pro, or Arg;

Xaa at position 46 is Ala, Ser, Pro, Tyr, Asn, or Thr;

Xaa at position 47 is Phe, Asn, Glu, Pro, Lys, Arg, or Ser;

Xaa at position 48 is Asn, His, Val, Arg, Pro, Thr, Asp, or Ile;

Xaa at position 49 is Arg, Tyr, Trp, Lys, Ser, His, Pro, or Val;

15 Xaa at position 50 is Ala, Asn, Pro, Ser, or Lys;

Xaa at position 51 is Val, Thr, Pro, His, Leu, Phe, or Ser;

Xaa at position 52 is Lys, Ile, Arg, Val, Asn, Glu, or Ser;

Xaa at position 53 is Ser, Ala, Phe, Val, Gly, Asn, Ile, Pro, or
        His;

20 Xaa at position 54 is Leu, Val, Trp, Ser, Ile, Phe, Thr, or His;

Xaa at position 55 is Gln, Ala, Pro, Thr, Glu, Arg, Trp, Gly, or
        Leu;

Xaa at position 56 is Asn, Leu, Val, Trp, Pro, or Ala;

Xaa at position 57 is Ala, Met, Leu, Pro, Arg, Glu, Thr, Gln,
25   Trp, or Asn;

Xaa at position 58 is Ser, Glu, Met, Ala, His, Asn, Arg, or Asp;

Xaa at position 59 is Ala, Glu, Asp, Leu, Ser, Gly, Thr, or Arg;

Xaa at position 60 is Ile, Met, Thr, Pro, Arg, Gly, Ala;

Xaa at position 61 is Glu, Lys, Gly, Asp, Pro, Trp, Arg, Ser,
30   Gln, or Leu;

Xaa at position 62 is Ser, Val, Ala, Asn, Trp, Glu, Pro, Gly, or
        Asp;

Xaa at position 63 is Ile, Ser, Arg, Thr, or Leu;

Xaa at position 64 is Leu, Ala, Ser, Glu, Phe, Gly, or Arg;

35 Xaa at position 65 is Lys, Thr, Gly, Asn, Met, Arg, Ile, or
        Asp;

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Xaa at position 66 is Asn, Trp, Val, Gly, Thr, Leu, Glu, or Arg;

Xaa at position 67 is Leu, Gln, Gly, Ala, Trp, Arg, Val, or Lys;

Xaa at position 68 is Leu, Gln, Lys, Trp, Arg, Asp, Glu, Asn,

   His, Thr, Ser, Ala, Tyr, Phe, Ile, Met or Val;

5   Xaa at position 69 is Pro, Ala, Thr, Trp, Arg, or Met;

Xaa at position 70 is Cys, Glu, Gly, Arg, Met, or Val;

Xaa at position 71 is Leu, Asn, Val, or Gln;

Xaa at position 72 is Pro, Cys, Arg, Ala, or Lys;

Xaa at position 73 is Leu, Ser, Trp, or Gly;

10   Xaa at position 74 is Ala, Lys, Arg, Val, or Trp;

Xaa at position 75 is Thr, Asp, Cys, Leu, Val, Glu, His, Asn, or

   Ser;

Xaa at position 76 is Ala, Pro, Ser, Thr, Gly, Asp, Ile, or Met;

Xaa at position 77 is Ala, Pro, Ser, Thr, Phe, Leu, Asp, or His;

15   Xaa at position 78 is Pro, Phe, Arg, Ser, Lys, His, Ala, Gly, Ile

   or Leu;

Xaa at position 79 is Thr, Asp, Ser, Asn, Pro, Ala, Leu, or Arg;

Xaa at position 80 is Arg, Ile, Ser, Glu, Leu, Val, Gln, Lys,

His,

20   Ala or Pro;

Xaa at position 81 is His, Gln, Pro, Arg, Val, Leu, Gly, Thr,

Asn,

   Lys, Ser, Ala, Trp, Phe, Ile or Tyr;

Xaa at position 82 is Pro, Lys, Tyr, Gly, Ile, or Thr;

25   Xaa at position 83 is Ile, Val, Lys, Ala, or Asn;

Xaa at position 84 is His, Ile, Asn, Leu, Asp, Ala, Thr, Glu,

   Gln, Ser, Phe, Met, Val, Lys, Arg, Tyr or Pro;

Xaa at position 85 is Ile, Leu, Arg, Asp, Val, Pro, Gln,

   Gly, Ser, Phe, or His;

30   Xaa at position 86 is Lys, Tyr, Leu, His, Arg, Ile, Ser, Gln,

   Pro;

Xaa at position 87 is Asp, Pro, Met, Lys, His, Thr, Val,

   Tyr, Glu, Asn, Ser, Ala, Gly, Ile, Leu or Gln;

Xaa at position 88 is Gly, Leu, Glu, Lys, Ser, Tyr, or Pro;

35   Xaa at position 89 is Asp, or Ser;

Xaa at position 90 is Trp, Val, Cys, Tyr, Thr, Met, Pro, Leu,

Gln, Lys, Ala, Phe, or Gly;

Xaa at position 91 is Asn, Pro, Ala, Phe, Ser, Trp, Gln, Tyr,

Leu, Lys, Ile, Asp, or His;

Xaa at position 92 is Glu, Ser, Ala, Lys, Thr, Ile, Gly, or Pro;

5   Xaa at position 94 is Arg, Lys, Asp, Leu, Thr, Ile, Gln,

His, Ser, Ala, or Pro;

Xaa at position 95 is Arg, Thr, Pro, Glu, Tyr, Leu, Ser, or Gly;

Xaa at position 96 is Lys, Asn, Thr, Leu, Gln, Arg,

His, Glu, Ser, Ala or Trp;

10   Xaa at position 97 is Leu, Ile, Arg, Asp, or Met;

Xaa at position 98 is Thr, Val, Gln, Tyr, Glu, His, Ser, or Phe;

Xaa at position 99 is Phe, Ser, Cys, His, Gly, Trp, Tyr, Asp,

Lys, Leu, Ile, Val or Asn;

Xaa at position 100 is Tyr, Cys, His, Ser, Trp, Arg, or Leu;

15   Xaa at position 101 is Leu, Asn, Val, Pro, Arg, Ala, His, Thr,

Trp, or Met;

Xaa at position 102 is Lys, Leu, Pro, Thr, Met, Asp, Val, Glu,

Arg, Trp, Ser,

Asn, His, Ala, Tyr, Phe, Gln, or Ile;

20   Xaa at position 103 is Thr, Ser, Asn, Ile, Trp, Lys, or Pro;

Xaa at position 104 is Leu, Ser, Pro, Ala, Glu, Cys, Asp, or Tyr;

Xaa at position 105 is Glu, Ser, Lys, Pro, Leu, Thr, Tyr, or Arg;

Xaa at position 106 is Asn, Ala, Pro, Leu, His, Val, or Gln;

Xaa at position 107 is Ala, Ser, Ile, Asn, Pro, Lys, Asp, or

25   Gly;

Xaa at position 108 is Gln, Ser, Met, Trp, Arg, Phe, Pro, His,

Ile, Tyr, or Cys;

Xaa at position 109 is Ala, Met, Glu, His, Ser, Pro, Tyr, or Leu;

30   and which can additionally have Met- or Met-Ala- preceding the

amino acid in position 1; and wherein from 4 to 44 of the amino

acids designated by Xaa are different from the corresponding

native amino acids of (1-133) human interleukin-3; or a

polypeptide having substantially the same structure and

35   substantially the same biological activity.

8. A (15-125)human interleukin-3 mutant polypeptide of the Formula VI:

```
Asn Cys Xaa Xaa Xaa Xaa Xaa Glu Xaa Xaa Xaa Xaa Leu Xaa Xaa
 1           5       10                  15

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Leu Xaa Xaa Glu Xaa
            20      25                  30

Xaa Xaa Xaa Leu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Leu Xaa
            35      40                  45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
            50      55                  60

Xaa Xaa Xaa Leu Xaa Xaa Xaa Xaa Xaa Cys Xaa Pro Xaa Xaa Xaa
            65      70                  75

Xaa Xaa Xaa Xaa Arg Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asp Xaa
            80      85                  90

Xaa Xaa Phe Xaa Xaa Lys Leu Xaa Phe Xaa Xaa Xaa Xaa Leu Xaa
            95      100                 105

Xaa Xaa Xaa Xaa Gln Gln [SEQ ID NO:20]
            110
```

wherein
Xaa at position 3 is Ser, Gly, Asp, Met, or Gln;
Xaa at position 4 is Asn, His, Leu, Ile, Phe, Arg, or Gln;
Xaa at position 5 is Met, Phe, Ile, Arg, or Ala;
Xaa at position 6 is Ile or Pro;
Xaa at position 7 is Asp, or Glu;
Xaa at position 9 is Ile, Val, Ala, Leu, or Gly;
Xaa at position 10 is Ile, Val, Phe, or Leu;
Xaa at position 11 is Thr, His, Gly, Gln, Arg, Pro, or Ala;

Xaa at position 12 is His, Phe, Gly, Arg, or Ala;

Xaa at position 14 is Lys, Leu, Gln, Gly, Pro, or Val;

Xaa at position 15 is Gln, Asn, Leu, Arg, or Val;

Xaa at position 16 is Pro, His, Thr, Gly, or Gln;

5   Xaa at position 17 is Pro, Asp, Gly, Ala, Arg, Leu, or Gln;

Xaa at position 18 is Leu, Arg, Gln, Asn, Gly, Ala, or Glu;

Xaa at position 19 is Pro, Leu, Gln, Ala, or Glu;

Xaa at position 20 is Leu, Val, Gly, Ser, Lys, Ala, Arg, Gln,
        Glu, Ile, Phe, Thr or Met;

10   Xaa at position 21 is Leu, Ala, Asn, Pro, Gln, or Val;

Xaa at position 22 is Asp or Leu;

Xaa at position 23 is Phe, Ser, Pro, Trp, or Ile;

Xaa at position 24 is Asn or Ala;

Xaa at position 27 is Asn, Cys, Arg, His, Met, or Pro;

15   Xaa at position 28 is Gly, Asp, Ser, Cys, Ala, Asn, Ile, Leu,
        Met, Tyr, or Arg;

Xaa at position 30 is Asp, or Glu;

Xaa at position 31 is Gln, Val, Met, Leu, Thr, Lys, Ala, Asn Glu,
        Ser or Trp;

20   Xaa at position 32 is Asp, Phe, Ser, Thr, Cys, Ala, Asn, Gln,
        Glu, His, Ile, Lys, Tyr, Val or Gly;

Xaa at position 33 is Ile, Val, or His;

Xaa at position 35 is Met, Asn, or Asp;

Xaa at position 36 is Glu, Thr, Ala, Asn, Ser or Asp;

25   Xaa at position 37 is Asn, Arg, Met, Pro, Ser, Thr, or His;

Xaa at position 38 is Asn or Gly;

Xaa at position 39 is Leu, Met, or Phe;

Xaa at position 40 is Arg, Ala or Ser;

Xaa at position 41 is Arg, Thr, Val, Leu, or Gly;

30   Xaa at position 42 is Pro, Gly, Cys, Ser, Gln, Ala, Arg, Asn,
        Glu, His, Leu, Thr, Val or Lys;

Xaa at position 45 is Glu, Tyr, His, Leu, or Arg;

Xaa at position 46 is Ala, Ser, Asn, or Thr;

Xaa at position 47 is Phe or Ser;

35   Xaa at position 48 is Asn, Val, Pro, Thr, or Ile;

Xaa at position 49 is Arg, Tyr, Lys, Ser, His, or Val;

Xaa at position 50 is Ala or Asn;

Xaa at position 51 is Val, Thr, Leu, or Ser;

Xaa at position 52 is Lys, Ile, Arg, Val, Asn, Glu, or Ser;

Xaa at position 53 is Ser, Phe, Val, Gly, Asn, Ile, or His;

Xaa at position 54 is Leu, Val, Ile, Phe, or His;

Xaa at position 55 is Gln, Ala, Pro, Thr, Glu, Arg, or Gly;

Xaa at position 56 is Asn or Pro;

Xaa at position 57 is Ala, Met, Pro, Arg, Glu, Thr, or Gln;

Xaa at position 58 is Ser, Glu, Met, Ala, His, Asn, Arg, or Asp;

Xaa at position 59 is Ala, Glu, Asp, Leu, Ser, Gly, Thr, Arg, or
        Pro;

Xaa at position 60 is Ile or Met;

Xaa at position 61 is Glu, Gly, Asp, Ser, or Gln;

Xaa at position 62 is Ser, Val, Ala, Asn, Glu, Pro, Gly, or
        Asp;

Xaa at position 63 is Ile, Ser, or Leu;

Xaa at position 65 is Lys, Thr, Gly, Asn, Met, Arg, Ile, or
        Asp;

Xaa at position 66 is Asn, Val, Gly, Thr, Leu, Glu, or Arg;

Xaa at position 67 is Leu, or Val;

Xaa at position 68 is Leu, Gln, Trp, Arg, Asp, Ala, Asn, Glu,
        His, Met, Phe, Ser, Thr, Tyr or Val;

Xaa at position 69 is Pro, Ala, Thr, Trp, or Met;

Xaa at position 71 is Leu or Val;

Xaa at position 73 is Leu or Ser;

Xaa at position 74 is Ala, Arg, or Trp;

Xaa at position 75 is Thr, Asp, Glu, His, Asn, or Ser;

Xaa at position 76 is Ala, Asp, or Met;

Xaa at position 77 is Ala, Pro, Ser, Thr, Phe, Leu, or Asp;

Xaa at position 78 is Pro or Ser;

Xaa at position 79 is Thr, Asp, Ser, Pro, Ala, Leu, or Arg;

Xaa at position 81 is His, Pro, Arg, Val, Leu, Gly, Asn, Ile,
Phe,
        Ser or Thr;

Xaa at position 82 is Pro or Tyr;

Xaa at position 83 is Ile, Val, or Ala;

Xaa at position 84 is His, Ile, Asn, Leu, Asp, Ala, Thr,
    Arg, Gln, Glu, Lys, Met, Ser, Tyr, Val or Pro;

Xaa at position 85 is Ile, Leu, Val, or Phe;

Xaa at position 86 is Lys, Leu, His, Arg, Ile, Gln, Pro or

5   Ser;

Xaa at position 87 is Asp, Pro, Met, Lys, His, Thr, Val,
    Asn, Ile, Leu or Tyr;

Xaa at position 88 is Gly, Glu, Lys, or Ser;

Xaa at position 90 is Trp, Val, Tyr, Met, or Leu;

10 Xaa at position 91 is Asn, Pro, Ala, Phe, Ser, Trp, Gln, Tyr,
    Leu, Lys, Ile, Asp, or His;

Xaa at position 92 is Glu, Ser, Ala, or Gly;

Xaa at position 94 is Arg, Ala, Gln, Ser or Lys;

Xaa at position 95 is Arg, Thr, Glu, Leu, Ser, or Gly;

15 Xaa at position 98 is Thr, Val, Gln, Glu, His, or Ser;

Xaa at position 100 is Tyr or Trp;

Xaa at position 101 is Leu or Ala;

Xaa at position 102 is Lys, Thr, Met, Val, Trp, Ser, Leu,
    Ala, Asn, Gln, His, Met, Phe, Tyr or Ile;

20 Xaa at position 103 is Thr, Ser, or Asn;

Xaa at position 105 is Glu, Ser, Pro, Leu, Thr, or Tyr;

Xaa at position 106 is Asn, Pro, Leu, His, Val, or Gln;

Xaa at position 107 is Ala, Ser, Ile, Asn, Pro, Lys, Asp, or
    Gly;

25 Xaa at position 108 is Gln, Ser, Met, Trp, Arg, Phe, Pro, His,
    Ile, Tyr, or Cys;

Xaa at position 109 is Ala, Met, Glu, His, Ser, Pro, Tyr, or Leu;

and which can additionally have Met- or Met-Ala- preceding the
30 amino acid in position 1; and wherein from 4 to 44 of the amino
acids designated by Xaa are different from the corresponding
amino acids of native (1-133) human interleukin-3; or a
polypeptide having substantially the same structure and
substantially the same biological activity.

35

    9. A (15-125)human interleukin-3 mutant polypeptide

according to Claim 7 of the Formula VII:

```
Asn Cys Xaa Xaa Xaa Ile Xaa Glu Xaa Xaa Xaa Xaa Leu Lys Xaa
 1           5   10                  15
```

```
Xaa Xaa Xaa Xaa Xaa Xaa Asp Xaa Xaa Asn Leu Asn Xaa Glu Xaa
             20  25                  30
```

```
Xaa Xaa Ile Leu Met Xaa Xaa Asn Leu Xaa Xaa Xaa Asn Leu Glu
             35  40                  45
```

```
Xaa Phe Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Xaa Xaa Xaa Ile
             50  55                  60
```

```
Glu Xaa Xaa Leu Xaa Xaa Leu Xaa Xaa Cys Xaa Pro Xaa Xaa Thr
             65  70                  75
```

```
Ala Xaa Pro Xaa Arg Xaa Xaa Xaa Xaa Xaa Xaa Xaa Gly Asp Xaa
             80  85                  90
```

```
Xaa Xaa Phe Xaa Xaa Lys Leu Xaa Phe Xaa Xaa Xaa Xaa Leu Glu
             95 100                 105
```

```
Xaa Xaa Xaa Xaa Gln Gln  [SEQ ID NO:21]
            110
```

wherein
Xaa at position 3 is Ser, Gly, Asp, Met, or Gln;
Xaa at position 4 is Asn, His, or Ile;
Xaa at position 5 is Met or Ile;
Xaa at position 7 is Asp or Glu;
Xaa at position 9 is Ile, Ala, Leu, or Gly;
Xaa at position 10 is Ile, Val, or Leu;
Xaa at position 11 is Thr, His, Gln, or Ala;
Xaa at position 12 is His or Ala;

Xaa at position 15 is Gln, Asn, or Val;

Xaa at position 16 is Pro, Gly, or Gln;

Xaa at position 17 is Pro, Asp, Gly, or Gln;

Xaa at position 18 is Leu, Arg, Gln, Asn, Gly, Ala, or Glu;

5   Xaa at position 19 is Pro or Glu;

Xaa at position 20 is Leu, Val, Gly, Ser, Lys, Ala, Arg,
        Gln, Glu, Ile, Phe, Thr or Met;

Xaa at position 21 is Leu, Ala, Asn, Pro, Gln, or Val;

Xaa at position 23 is Phe, Ser, Pro, or Trp;

10   Xaa at position 24 is Asn or Ala;

Xaa at position 28 is Gly, Asp, Ser, Cys, Ala, Asn, Ile,
        Leu, Met Tyr or Arg;

Xaa at position 30 is Asp or Glu;

Xaa at position 31 is Gln, Val, Met, Leu, Thr, Ala, Asn,

15   Glu, Ser or Lys;

Xaa at position 32 is Asp, Phe, Ser, Thr, Ala, Asn, Gln, Glu,
        His, Ile, Lys, Tyr, Val or Cys;

Xaa at position 36 is Glu, Ala, Asn, Ser or Asp;

Xaa at position 37 is Asn, Arg, Met, Pro, Ser, Thr, or His;

20   Xaa at position 40 is Arg or Ala;

Xaa at position 41 is Arg, Thr, Val, Leu, or Gly;

Xaa at position 42 is Pro, Gly, Ser, Gln, Ala, Arg, Asn, Glu,
Leu, Thr, Val   or Lys;

Xaa at position 46 is Ala or Ser;

25   Xaa at position 48 is Asn, Pro, Thr, or Ile;

Xaa at position 49 is Arg or Lys;

Xaa at position 50 is Ala or Asn;

Xaa at position 51 is Val or Thr;

Xaa at position 52 is Lys or Arg;

30   Xaa at position 53 is Ser, Phe, or His;

Xaa at position 54 is Leu, Ile, Phe, or His;

Xaa at position 55 is Gln, Ala, Pro, Thr, Glu, Arg, or Gly;

Xaa at position 57 is Ala, Pro, or Arg;

Xaa at position 58 is Ser, Glu, Arg, or Asp;

35   Xaa at position 59 is Ala or Leu;

Xaa at position 62 is Ser, Val, Ala, Asn, Glu, Pro, or Gly;

Xaa at position 63 is Ile or Leu;

Xaa at position 65 is Lys, Thr, Gly, Asn, Met, Arg, Ile, Gly, or
    Asp;

Xaa at position 66 is Asn, Gly, Glu, or Arg;

5   Xaa at position 68 is Leu, Gln, Trp, Arg, Asp, Ala, Asn, Glu,
    His, Ile, Met, Phe, Ser, Thr, Tyr or Val;

Xaa at position 69 is Pro or Thr;

Xaa at position 71 is Leu or Val;

Xaa at position 73 is Leu or Ser;

10 Xaa at position 74 is Ala or Trp;

Xaa at position 77 is Ala or Pro;

Xaa at position 79 is Thr, Asp, Ser, Pro, Ala, Leu, or Arg;

Xaa at position 81 is His, Pro, Arg, Val, Leu, Gly, Asn, Phe,
    Ser or Thr;

15 Xaa at position 82 is Pro or Tyr;

Xaa at position 83 is Ile or Val;

Xaa at position 84 is His, Ile, Asn, Leu, Ala, Thr, Leu, Arg,
    Gln, Leu, Lys, Met, Ser, Tyr, Val or Pro;

Xaa at position 85 is Ile, Leu, or Val;

20 Xaa at position 86 is Lys, Arg, Ile, Gln, Pro, or Ser;

Xaa at position 87 is Asp, Pro, Met, Lys, His, Thr, Asn, Ile,
    Leu or Tyr;

Xaa at position 90 is Trp or Leu;

Xaa at position 91 is Asn, Pro, Ala, Ser, Trp, Gln, Tyr, Leu,
25   Lys, Ile, Asp, or His;

Xaa at position 92 is Glu, or Gly;

Xaa at position 94 is Arg, Ala, or Ser;

Xaa at position 95 is Arg, Thr, Glu, Leu, or Ser;

Xaa at position 98 is Thr, Val, or Gln;

30 Xaa at position 100 is Tyr or Trp;

Xaa at position 101 is Leu or Ala;

Xaa at position 102 is Lys, Thr, Val, Trp, Ser, Ala, His,
    Met, Phe, Tyr or Ile;

Xaa at position 103 is Thr or Ser;

35 Xaa at position 106 is Asn, Pro, Leu, His, Val, or Gln;

Xaa at position 107 is Ala, Ser, Ile, Asn, Pro, Asp, or Gly;

Xaa at position 108 is Gln, Ser, Met, Trp, Arg, Phe, Pro, His,
        Ile, Tyr, or Cys;
Xaa at position 109 is Ala, Met, Glu, His, Ser, Pro, Tyr, or Leu;

5   which can additionally have Met- or Met-Ala- preceding the amino
acid in position 1; and wherein from 4 to 35 of the amino acids
designated by Xaa are different from the corresponding amino
acids of native human interleukin-3.

10   10. A (15-125)human interleukin-3 mutant polypeptide
according to Claim 7 of the Formula VIII:

Asn Cys Xaa Xaa Met Ile Asp Glu Xaa Ile Xaa Xaa Leu Lys Xaa
 1   5   10   15
15

Xaa Pro Xaa Pro Xaa Xaa Asp Phe Xaa Asn Leu Asn Xaa Glu Asp
            20   25   30

Xaa Xaa Ile Leu Met Xaa Xaa Asn Leu Arg Xaa Xaa Asn Leu Glu
20   35   40   45

Ala Phe Xaa Arg Xaa Xaa Lys Xaa Xaa Xaa Asn Ala Ser Ala Ile
            50   55   60

25 Glu Xaa Xaa Leu Xaa Xaa Leu Xaa Pro Cys Leu Pro Xaa Xaa Thr
            65   70   75

Ala Xaa Pro Xaa Arg Xaa Pro Ile Xaa Xaa Xaa Xaa Gly Asp Trp
            80   85   90
30

Xaa Glu Phe Xaa Xaa Lys Leu Xaa Phe Tyr Leu Xaa Xaa Leu Glu
            95 100   105

Xaa Xaa Xaa Xaa Gln Gln [SEQ ID NO:22]
35   110
wherein

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Xaa at position 3 is Ser, Gly, Asp, or Gln;

Xaa at position 4 is Asn, His, or Ile;

Xaa at position 9 is Ile, Ala, Leu, or Gly;

Xaa at position 11 is Thr, His, or Gln;

5   Xaa at position 12 is His or Ala;

Xaa at position 15 is Gln or Asn;

Xaa at position 16 is Pro or Gly;

Xaa at position 18 is Leu, Arg, Asn, or Ala;

Xaa at position 20 is Leu, Val, Ser, Ala, Arg, Gln, Glu, Ile,

10   Phe, Thr or Met;

Xaa at position 21 is Leu, Ala, Asn, or Pro;

Xaa at position 24 is Asn or Ala;

Xaa at position 28 is Gly, Asp, Ser, Ala, Asn, Ile, Leu, Met,

Tyr or Arg;

15   Xaa at position 31 is Gln, Val, Met, Leu, Ala, Asn, Glu or Lys;

Xaa at position 32 is Asp, Phe, Ser, Ala, Gln, Glu, His, Val

or Thr;

Xaa at position 36 is Glu, Asn, Ser or Asp;

Xaa at position 37 is Asn, Arg, Pro, Thr, or His;

20   Xaa at position 41 is Arg, Leu, or Gly;

Xaa at position 42 is Pro, Gly, Ser, Ala, Asn, Val, Leu or Gln;

Xaa at position 48 is Asn, Pro, or Thr;

Xaa at position 50 is Ala or Asn;

Xaa at position 51 is Val or Thr;

25   Xaa at position 53 is Ser or Phe;

Xaa at position 54 is Leu or Phe;

Xaa at position 55 is Gln, Ala, Glu, or Arg;

Xaa at position 62 is Ser, Val, Asn, Pro, or Gly;

Xaa at position 63 is Ile or Leu;

30   Xaa at position 65 is Lys, Asn, Met, Arg, Ile, or Gly;

Xaa at position 66 is Asn, Gly, Glu, or Arg;

Xaa at position 68 is Leu, Gln, Trp, Arg, Asp, Asn, Glu, His,

Met, Phe, Ser, Thr, Tyr or Val;

Xaa at position 73 is Leu or Ser;

35   Xaa at position 74 is Ala or Trp;

Xaa at position 77 is Ala or Pro;

322

Xaa at position 79 is Thr, Asp, or Ala;

Xaa at position 81 is His, Pro, Arg, Val, Gly, Asn, Ser or Thr;

Xaa at position 84 is His, Ile, Asn, Ala, Thr, Arg, Gln, Glu,
Lys, Met, Ser, Tyr, Val or Leu;

5   Xaa at position 85 is Ile or Leu;

Xaa at position 86 is Lys or Arg;

Xaa at position 87 is Asp, Pro, Met, Lys, His, Pro, Asn, Ile, Leu
or Tyr;

Xaa at position 91 is Asn, Pro, Ser, Ile or Asp;

10   Xaa at position 94 is Arg, Ala, or Ser;

Xaa at position 95 is Arg, Thr, Glu, Leu, or Ser;

Xaa at position 98 is Thr or Gln;

Xaa at position 102 is Lys, Val, Trp, or Ile;

Xaa at position 103 is Thr, Ala, His, Phe, Tyr or Ser;

15   Xaa at position 106 is Asn, Pro, Leu, His, Val, or Gln;

Xaa at position 107 is Ala, Ser, Ile, Pro, or Asp;

Xaa at position 108 is Gln, Met, Trp, Phe, Pro, His, Ile, or Tyr;

Xaa at position 109 is Ala, Met, Glu, Ser, or Leu;

20   and which can additionally have Met- or Met-Ala- preceding the
amino acid in position 1; and wherein from 4 to 26 of the amino
acids designated by Xaa are different from the corresponding
amino acids of native (1-133)human interleukin-3; or a
polypeptide having substantially the same structure and
25   substantially the same biological activity.

    11. A (15-125) human interleukin-3 mutant
polypeptide of claim 7 wherein:

30   Xaa at position 17 is Ser, Lys, Asp, Met, Gln, or Arg;

Xaa at position 18 is Asn, His, Leu, Ile, Phe, Arg, or Gln;

Xaa at position 19 is Met, Arg, Gly, Ala, or Cys;

Xaa at position 20 is Ile, Cys, Gln, Glu, Arg, Pro, or Ala;

Xaa at position 21 is Asp, Phe, Lys, Arg, Ala, Gly, or Val;

35   Xaa at position 22 is Glu, Trp, Pro, Ser, Ala, His, or Gly;

Xaa at position 23 is Ile, Ala, Gly, Trp, Lys, Leu, Ser, or Arg;

Xaa at position 24 is Ile, Gly, Arg, or Ser;

Xaa at position 25 is Thr, His, Gly, Gln, Arg, Pro, or Ala;

Xaa at position 26 is His, Thr, Phe, Gly, Ala, or Trp;

Xaa at position 27 is Leu, Gly, Arg, Thr, Ser, or Ala;

5 Xaa at position 28 is Lys, Leu, Gln, Gly, Pro, Val or Trp;

Xaa at position 29 is Gln, Asn, Leh, Pro, Arg, or Val;

Xaa at position 30 is Pro, His, Thr, Gly, Asp, Gln, Ser, Leu, or Lys;

Xaa at position 31 is Pro, Asp, Gly, Arg, Leu, or Gln;

10 Xaa at position 32 is Leu, Arg, Gln, Asn, Gly, Ala, or Glu;

Xaa at position 33 is Pro, Leu, Gln, Thr, or Glu;

Xaa at position 34 is Leu, Gly, Ser, or Lys;

Xaa at position 35 is Leu, Ala, Gly, Asn, Pro, or Gln;

Xaa at position 36 is Asp, Leu, or Val;

15 Xaa at position 37 is Phe, Ser, or Pro;

Xaa at position 38 is Asn, or Ala;

Xaa at position 40 is Leu, Trp, or Arg;

Xaa at position 41 is Asn, Cys, Arg, Leu, His, Met, Pro;

Xaa at position 42 is Gly, Asp, Ser, Cys, or Ala;

20 Xaa at position 42 is Glu, Asn, Tyr, Leu, Phe, Asp, Ala, Cys, or Ser;

Xaa at position 44 is Asp, Ser, Leu, Arg, Lys, Thr, Met, Trp, or Pro;

Xaa at position 45 is Gln, Pro, Phe, Val, Met, Leu, Thr, Lys, or

25 Trp;

Xaa at position 46 is Asp, Phe, Ser, Thr, Cys, or Gly;

Xaa at position 47 is Ile, Gly, Ser, Arg, Pro, or His;

Xaa at position 48 is Leu, Ser, Cys, Arg, His, Phe, or Asn;

Xaa at position 49 is Met, Arg, Ala, Gly, Pro, Asn, His, or Asp;

30 Xaa at position 50 is Glu, Leu, Thr, Asp, or Tyr;

Xaa at position 51 is Asn, Arg, Met, Pro, Ser, Thr, or His;

Xaa at position 52 is Asn, His, Arg, Leu, Gly, Ser, or Thr;

Xaa at position 53 is Leu, Thr, Ala, Gly, Glu, Pro, Lys, Ser, or;

Xaa at position 54 is Arg, Asp, Ile, Ser, Val, Thr, Gln, or Leu;

35 Xaa at position 55 is Arg, Thr, Val, Ser, Leu, or Gly;

Xaa at position 56 is Pro, Gly, Cys, Ser, Gln, or Lys;

Xaa at position 57 is Asn or Gly;

Xaa at position 58 is Leu, Ser, Asp, Arg, Gln, Val, or Cys;

Xaa at position 59 is Glu Tyr, His, Leu, Pro, or Arg;

Xaa at position 60 is Ala, Ser, Tyr, Asn, or Thr;

5   Xaa at position 61 is Phe, Asn, Glu, Pro, Lys, Arg, or Ser;

Xaa at position 62 is Asn His, Val, Arg, Pro, Thr, or Ile;

Xaa at position 63 is Arg, Tyr, Trp, Ser, Pro, or Val;

Xaa at position 64 is Ala, Asn, Ser, or Lys;

Xaa at position 65 is Val, Thr, Pro, His, Leu, Phe, or Ser;

10   Xaa at position 66 is Lys, Ile, Val, Asn, Glu, or Ser;

Xaa at position 67 is Ser, Ala, Phe, Val, Gly, Asn, Ile, Pro, or

His;

Xaa at position 68 is Leu, Val, Trp, Ser, Thr, or His;

Xaa at position 69 is Gln, Ala, Pro, Thr, Arg, Trp, Gly, or Leu;

15   Xaa at position 70 is Asn, Leu, Val, Trp, Pro, or Ala;

Xaa at position 71 is Ala, Met, Leu, Arg, Glu, Thr, Gln, Trp, or

Asn;

Xaa at position 72 is Ser, Glu, Met, Ala, His, Asn, Arg, or Asp;

Xaa at position 73 is Ala, Glu, Asp, Leu, Ser, Gly, Thr, or Arg;

20   Xaa at position 74 is Ile, Thr, Pro, Arg, Gly, Ala;

Xaa at position 75 is Glu, Lys, Gly, Asp, Pro, Trp, Arg, Ser, or

Leu;

Xaa at position 76 is Ser, Val, Ala, Asn, Trp, Glu, Pro, Gly, or

Asp;

25   Xaa at position 77 is Ile, Ser, Arg, or Thr;

Xaa at position 78 is Leu, Ala, Ser, Glu, Gly, or Arg;

Xaa at position 79 is Lys, Thr, Gly, Asn, Met, Ile, or

     Asp;

Xaa at position 80 is Asn, Trp, Val, Gly, Thr, Leu, or Arg;

30   Xaa at position 81 is Leu, Gln, Gly, Ala, Trp, Arg, or Lys;

Xaa at position 82 is Leu, Gln, Lys, Trp, Arg, or Asp;

Xaa at position 83 is Pro, Thr, Trp, Arg, or Met;

Xaa at position 84 is Cys, Glu, Gly, Arg, Met, or Val;

Xaa at position 85 is Leu, Asn, or Gln;

35   Xaa at position 86 is Pro, Cys, Arg, Ala, or Lys;

Xaa at position 87 is Leu, Ser, Trp, or Gly;

Xaa at position 88 is Ala, Lys, Arg, Val, or Trp;

Xaa at position 89 is Thr, Asp, Cys, Leu, Val, Glu, His, or Asn;

Xaa at position 90 is Ala, Ser, Asp, Ile, or Met;

Xaa at position 91 is Ala, Ser, Thr, Phe, Leu, Asp, or His;

5   Xaa at position 92 is Pro, Phe, Arg, Ser, Lys, His, or Leu;

Xaa at position 93 is Thr, Asp, Ser, Asn, Pro, Ala, Leu, or Arg;

Xaa at position 94 is Arg, Ile, Ser, Glu, Leu, Val, or Pro;

Xaa at position 95 is His, Gln, Pro, Val, Leu, Thr or Tyr;

Xaa at position 96 is Pro, Lys, Tyr, Gly, Ile, or Thr;

10   Xaa at position 97 is Ile, Lys, Ala, or Asn;

Xaa at position 98 is His, Ile, Asn, Leu, Asp, Ala, Thr, or Pro;

Xaa at position 99 is Ile, Arg, Asp, Pro, Gln, Gly, Phe, or His;

Xaa at position 100 is Lys, Tyr, Leu, His, Ile, Ser, Gln, or Pro;

Xaa at position 101 is Asp, Pro, Met, Lys, His, Thr, Val, Tyr, or

15   Gln;

Xaa at position 102 is Gly, Leu, Glu, Lys, Ser, Tyr, or Pro;

Xaa at position 103 is Asp, or Ser;

Xaa at position 104 is Trp, Val, Cys, Tyr, Thr, Met, Pro, Leu,

    Gln, Lys, Ala, Phe, or Gly;

20   Xaa at position 105 is Asn, Pro, Ala, Phe, Ser, Trp, Gln, Tyr,

Leu, Lys, Ile, or His;

Xaa at position 106 is Glu, Ser, Ala, Lys, Thr, Ile, Gly, or Pro;

Xaa at position 108 is Arg, Asp, Leu, Thr, Ile, or Pro;

Xaa at position 109 is Arg, Thr, Pro, Glu, Tyr, Leu, Ser, or Gly.

25

        12. The human interleukin-3 mutant polypetide of

claim 7:

        wherein;

30   Xaa at position 28 is Gly, Asp, Ser, Ile, Leu, Met, Tyr, or Ala;

Xaa at position 31 is Gln, Val, Met or Asn;

Xaa at position 32 is Asp, Ser, Ala, Gln, His or Val;

Xaa at position 36 is Glu or Asp;

Xaa at position 37 is Asn, Pro or Thr;

35   Xaa at position 48 is Asn or Pro;

Xaa at position 62 is Ser, or Pro;

326

Xaa at position 68 is Leu, Trp, Asp, Asn Glu, His, Phe, Ser or
Tyr;

Xaa at position 81 is His, Arg, Thr, Asn or Ser;

Xaa at position 84 is His, Ile, Leu, Ala, Arg, Gln, Lys, Met,
5   Ser,

      Tyr or Val;

Xaa at position 86 is Lys or Arg;

Xaa at position 87 is Asp, Pro, His, Asn, Ile or Leu;

Xaa at position 91 is Asn, or Pro;

10 Xaa at position 94 is Arg, Ala, or Ser;

Xaa at position 102 is Lys, Val, Trp, Ala, His, Phe, or Tyr;

Xaa at position 107 is Ala, or Ile;

Xaa at position 108 is Gln, or Ile; and

Xaa at position 109 is Ala, Met or Glu.

15

      13.   A polypeptide of the formula

      1   5   10

(Met)$_m$-Ala Pro Met Thr Gln Thr Thr Ser Leu Lys Thr
20   15   20

Ser Trp Val Asn Cys Ser Xaa Xaa Xaa Asp Glu Ile Ile
25   30   35

Xaa His Leu Lys Xaa Pro Pro Xaa Pro Xaa Leu Asp Xaa
        40   45   50

25 Xaa Asn Leu Asn Xaa Glu Asp Xaa Asp Ile Leu Xaa Glu
            55   60

Xaa Asn Leu Arg Xaa Xaa Asn Leu Xaa Xaa Phe Xaa Xaa
      65   70   75

Ala Xaa Lys Xaa Leu Xaa Asn Ala Ser Xaa Ile Glu Xaa
30   80   85

Ile Leu Xaa Asn Leu Xaa Pro Cys Xaa Pro Xaa Xaa Thr
90   95   100

Ala Xaa Pro Xaa Arg Xaa Pro Ile Xaa Ile Xaa Xaa Gly
       105   110   115

35 Asp Trp Xaa Glu Phe Arg Xaa Lys Leu Xaa Phe Tyr Leu
           120   125

Xaa Xaa Leu Glu Xaa Ala Gln Xaa Gln Gln Thr Thr Leu

    130

Ser Leu Ala Ile Phe [SEQ ID NO:129]

5   wherein m is 0 or 1; Xaa at position 18 is Asn or Ile; Xaa at position 19 is Met, Ala or Ile; Xaa at position 20 is Ile, Pro or Ile; Xaa at position 23 is Ile, Ala or Leu; Xaa at position 25 is Thr or His; Xaa at position 29 is Gln, Arg, Val or Ile; Xaa at position

10   32 is Leu, Ala, Asn or Arg; Xaa at position 34 is Leu or Ser; Xaa at position 37 is Phe, Pro, or Ser; Xaa at position 38 is Asn or Ala; Xaa at position 42 is Gly, Ala, Ser, Asp or Asn; Xaa at position 45 is Gln, Val, or Met; Xaa at position 46 is Asp or Ser; Xaa at

15   position 49 is Met, Ile, Leu or Asp; Xaa at position 50 is Glu or Asp; Xaa at position 51 is Asn Arg or Ser; Xaa at position 55 is Arg, Leu, or Thr; Xaa at position 56 is Pro or Ser; Xaa at position 59 is Glu or Leu; Xaa at position 60 is Ala or Ser; Xaa at

20   position 62 is Asn, Val or Pro; Xaa at position 63 is Arg or His; Xaa at position 65 is Val or Ser; Xaa at position 67 is Ser, Asn, His or Gln; Xaa at position 69 is Gln or Glu; Xaa at position 73 is Ala or Gly; Xaa at position 76 is Ser, Ala or Pro; Xaa at position

25   79 is Lys, Arg or Ser; Xaa at position 82 is Leu, Glu, Val or Trp; Xaa at position 85 is Leu or Val; Xaa at position 87 is Leu, Ser, Tyr; Xaa at position 88 is Ala or Trp; Xaa at position 91 is Ala or Pro; Xaa at position 93 is Pro or Ser; Xaa at position 95 is His

30   or Thr; Xaa at position 98 is His, Ile, or Thr; Xaa at position 100 is Lys or Arg; Xaa at position 101 is Asp, Ala or Met; Xaa at position 105 is Asn or Glu; Xaa at position 109 is Arg, Glu or Leu; Xaa at position 112 is Thr or Gln; Xaa at position 116 is

35   Lys, Val, Trp or Ser; Xaa at position 117 is Thr or Ser; Xaa at position 120 is Asn, Gln, or His; Xaa at

position 123 is Ala or Glu; with the proviso that from four to forty-four of the amino acids designated by Xaa are different from the corresponding amino acids of native human interleukin-3; or a polypeptide having substantially the same structure and substantially the same biological activity.

14.   A polypeptide according to Claim 13 wherein Xaa at position 18 is Ile; Xaa at position 19 is Ala, or Ile; Xaa at position 20 is Pro, or Leu; Xaa at position 23 is Ala, or Leu; Xaa at position 25 is His; Xaa at position 29 is Arg, Val, or Ile; Xaa at position 32 is Ala, Asn or Arg; Xaa at position 34 is Ser; Xaa at position 37 is Pro or Ser; Xaa at position 38 is Ala; Xaa at position 42 is Ala, Ser, Asp, or Asn; and Xaa at position 45 is Val or Met; Xaa at position 46 is Ser.

15.   A polypeptide according to Claim 13 wherein Xaa at position 49 is Ile, or Leu, or Asp; Xaa at position 50 is Asp; Xaa at position 51 is Arg or Ser; Xaa at position 55 is Leu or Thr; Xaa at position 56 is Ser; Xaa at position 59 is Glu or Leu; Xaa at position 60 is Ala or Ser; Xaa at position 62 is Val, or Pro; Xaa at position 63 is His; Xaa at position 65 is Ser; Xaa at position 67 is Asn, or His, or Gln; and Xaa at position 69 is Glu.

16.   A polypeptide according to Claim 13 wherein Xaa at position 73 is Gly; Xaa at position 76 is Ala, or Pro; Xaa at position 79 is Arg, or Ser; Xaa at position 82 is Gln or Val, or Trp; Xaa at position 85 is Val; Xaa at position 87 is Ser, or Tyr; Xaa at position 88 is Trp; Xaa at position 91 is Pro; Xaa at position 93 is Ser; Xaa at position 95 is Thr; Xaa at

position 98 is Ile or Thr; Xaa at position 100 is Arg; Xaa at position 101 is Ala, or Met; and Xaa at position 105 is Glu.

5   17. A polypeptide according to Claim 13 wherein Xaa at position 109 is Glu, or Leu; Xaa at position 112 is Gln; Xaa at position 116 is Val, or Trp, or Ser; Xaa at position 117 is Ser; Xaa at position 120 is Glu or His; and Xaa at position 123 is

10   Glu.

     18. A polypeptide according to Claim 13 wherein Xaa at position 18 is Ile; Xaa at position 19 is Ala, or Ile; Xaa at position 20 is Pro, or Leu; Xaa

15   at position 23 is Ala, or Leu; Xaa at position 25 is His; Xaa at position 29 is Arg or Val, or Ile; Xaa at position 32 is Ala or Asn, or Arg; Xaa at position 34 is Ser; Xaa at position 37 is Pro or Ser; Xaa at position 38 is Ala; Xaa at position 42 is Ala or Ser,

20   Asp or Asn; Xaa at position 45 is Val or Met; Xaa at position 46 is Ser; Xaa at position 49 is Ile, or Leu, or Asp; Xaa at position 50 is Asp; Xaa at position 51 is Arg, or Ser; Xaa at position 55 is Leu or Thr; Xaa at position 56 is Ser; Xaa at position 59 is Glu or

25   Leu; Xaa at position 60 is Ala or Ser; Xaa at position 62 is Val, or Pro; Xaa at position 63 is His; Xaa at position 65 is Ser; Xaa at position 67 is Asn, or His, or Gln; and Xaa at position 69 is Glu.

30   19. A polypeptide according to Claim 13 wherein Xaa at position 73 is Gly; Xaa at position 76 is Ala, or Pro; Xaa at position 79 is Arg, or Ser; Xaa at position 82 is Gln or Val, or Trp; Xaa at position 85 is Val; Xaa at position 87 is Ser, or Tyr; Xaa at

35   position 88 is Trp; Xaa at position 91 is Pro; Xaa at position 93 is Ser; Xaa at position 95 is Thr; Xaa at

position 98 is Ile or Thr; Xaa at position 100 is Arg; Xaa at position 101 is Ala, or Met; Xaa at position 105 is Glu; Xaa at position 109 is Glu, or Leu; Xaa at position 112 is Gln; Xaa at position 116 is Val, or Trp, or Ser; Xaa at position 117 is Ser; Xaa at position 120 is Glu or His; and Xaa at position 123 is Glu.

20. A polypeptide of the formula

```
                  1                5                    10
(Metm-Alan)p-Asn Cys Ser Xaa Xaa Xaa Asp Glu Xaa Ile
                     15                     20
Xaa His Leu Lys Xaa Pro Pro Xaa Pro Xaa Leu Asp Xaa

        25                 30                     35
Xaa Asn Leu Asn Xaa Glu Asp Xaa Xaa Ile Leu Xaa Glu
            40                     45
Xaa Asn Leu Arg Xaa Xaa Asn Leu Xaa Xaa Phe Xaa Xaa
50                     55                     60
Ala Xaa Lys Xaa Leu Xaa Asn Ala Ser Xaa Ile Glu Xaa
        65                     70                     75
Ile Leu Xaa Asn Xaa Xaa Pro Cys Xaa Pro Xaa Ala Thr
                80                     85
Ala Xaa Pro Xaa Arg Xaa Pro Ile Xaa Ile Xaa Xaa Gly
    90                     95                     100
Asp Trp Xaa Glu Phe Arg Xaa Lys Leu Xaa Phe Tyr Leu
        105                    110
Xaa Xaa Leu Glu Xaa Ala Gln Xaa Gln Gln [SEQ ID
NO:130]
```

wherein m is 0 or 1; n is 0 or 1; p is 0 or 1; Xaa at position 4 is Asn or Ile; Xaa at position 5 is Met, Ala or Ile: Xaa at position 6 is Ile, Pro or Leu; Xaa at position 9 is Ile, Ala or Leu; Xaa at position 11 is Thr or His; Xaa at position 15 is Gln, Arg, Val or Ile; Xaa at position 18 is Leu, Ala, Asn or Arg; Xaa

at position 20 is Leu or Ser; Xaa at position 23 is
Phe, Pro, or Ser; Xaa at position 24 is Asn or Ala;
Xaa at position 28 is Gly, Ala, Ser, Asp or Asn; Xaa
at position 31 is Gln, Val, or Met; Xaa at position 32

5 is Asp or Ser; Xaa at position 35 is Met, Ile or Asp;
Xaa at position 36 is Glu or Asp; Xaa at position 37
is Asn, Arg or Ser; Xaa at position 41 is Arg, Leu, or
Thr; Xaa at position 42 is Pro or Ser; Xaa at position
45 is Glu or Leu; Xaa at position 46 is Ala or Ser;

10 Xaa at position 48 is Asn, Val or Pro; Xaa at position
49 is Arg or His; Xaa at position 51 is Val or Ser;
Xaa at position 53 is Ser, Asn, His or Gln; Xaa at
position 55 is Gln or Glu; Xaa at position 59 is Ala
or Gly; Xaa at position 62 is Ser, Ala or Pro; Xaa at

15 position 65 is Lys, Arg or Ser; Xaa at position 67 is
Leu, Glu, or Val; Xaa at position 68 is Leu, Glu, Val
or Trp; Xaa at position 71 is Leu or Val; Xaa at
position 73 is Leu, Ser or Tyr; Xaa at position 74 is
Ala or Trp; Xaa at position 77 is Ala or Pro; Xaa at

20 position 79 is Pro or Ser; Xaa at position 81 is His
or Thr; Xaa at position 84 is His, Ile, or Thr; Xaa at
position 86 is Lys or Arg; Xaa at position 87 is Asp,
Ala or Met; Xaa at position 91 is Asn or Glu; Xaa at
position 95 is Arg, Glu, Leu; Xaa at position 98 Thr

25 or Gln; Xaa at position 102 is Lys, Val, Trp or Ser;
Xaa at position 103 is Thr or Ser; Xaa at position 106
is Asn, Gln, or His; Xaa at position 109 is Ala or
Glu; with the proviso that from four to forty-four of
the amino acids designated by Xaa are different from

30 the corresponding amino acids of native (15-125)human
interleukin-3; or a polypeptide having substantially
the same structure and substantially the same
biological activity.

35   21. A polypeptide according to Claim 20
wherein Xaa at position 4 is Ile; Xaa at position 5 is

Ala, or Ile; Xaa at position 6 is Pro, or Leu; Xaa at position 9 is Ala, or Leu; Xaa at position 11 is His; Xaa at position 15 is Arg or Val, or Ile; Xaa at position 18 is Ala or Asn, or Arg; Xaa at position 20

5   is Ser; Xaa at position 23 is Pro or Ser; Xaa at position 24 is Ala; Xaa at position 28 is Ala or Ser, or Asp, or Asn; Xaa at position 31 is Val or Met; and Xaa at position 32 is Ser.

10   22.   A polypeptide according to Claim 20 wherein Xaa at position 35 is Ile, or Leu, or Asp; Xaa at position 36 is Asp; Xaa at position 37 is Arg, or Ser; Xaa at position 41 is Leu or Thr; Xaa at position 42 is Ser; Xaa at position 45 is Glu or Leu; Xaa at

15   position 46 is Ala or Ser; Xaa at position 48 is Val, or Pro; Xaa at position 49 is His; Xaa at position 51 is Ser; Xaa at position 53 is Asn, or His, or Gln; and Xaa at position 55 is Glu.

20   23.   A polypeptide according to Claim 20 wherein Xaa at position 59 is Gly; Xaa at position 62 is Ala, or Pro; Xaa at position 65 is Arg, or Ser; Xaa at position 67 is Gln or Val; Xaa at position 68 is Glu, or Val, or Trp; Xaa at position 71 is Val; Xaa at

25   position 73 is Ser, or Tyr; Xaa at position 74 is Trp; Xaa at position 77 is Pro; Xaa at position 79 is Ser; Xaa at position 81 is Thr; Xaa at position 84 is Ile or Thr; Xaa at position 86 is Arg; Xaa at position 87 is Ala, or Met; and Xaa at position 91 is Glu.

30

         24.   A polypeptide according to Claim 20 wherein Xaa at position 95 is Glu, or Leu; Xaa at position 98 ia Gln; Xaa at position 102 is Val, or Trp, or Ser; Xaa at position 103 is Ser; Xaa at

35   position 106 is Glu or His; and Xaa at position 109 is Glu.

25. A polypeptide according to Claim 20 wherein Xaa at position 4 is Ile; Xaa at position 5 is Ala, or Ile; Xaa at position 6 is Pro, or Leu; Xaa at position 9 is Ala, or Leu; Xaa at position 11 is His; Xaa at position 15 is Arg or Val, or Ile; Xaa at position 18 is Ala or Asn, or Arg; Xaa at position 20 is Ser; Xaa at position 23 is Pro or Ser; Xaa at position 24 is Ala; Xaa at position 28 is Ala or Ser, or Asp, or Asn; Xaa at position 31 is Val or Met; Xaa at position 32 is Ser; Xaa at position 35 is Ile, or Leu, or Asp; Xaa at position 36 is Asp; Xaa at position 37 is Arg, or Ser; Xaa at position 41 is Leu or Thr; Xaa at position 42 is Ser; Xaa at position 45 is Glu or Leu; Xaa at position 46 is Ala or Ser; Xaa at position 48 is Val, or Pro; Xaa at position 49 is His; Xaa at position 51 is Ser; Xaa at position 53 is Asn, or His, or Gln; and Xaa at position 55 is Glu.

26. A polypeptide according to Claim 20 wherein Xaa at position 59 is Gly; Xaa at position 62 is Ala, or Pro; Xaa at position 65 is Arg, or Ser; Xaa at position 67 is Gln or Val; Xaa at position 68 is Glu, or Val, or Trp; Xaa at position 71 is Val; Xaa at position 73 is Ser, or Tyr; Xaa at position 74 is Trp; Xaa at position 77 is Pro; Xaa at position 79 is Ser; Xaa at position 81 is Thr; Xaa at position 84 is Ile or Thr; Xaa at position 86 is Arg; Xaa at position 87 is Ala, or Met; Xaa at position 91 is Glu; Xaa at position 95 is Glu, or Lue; Xaa at position 98 is Gln; Xaa at position 102 is Val, or Trp, or Ser; Xaa at position 103 is Ser; Xaa at position 106 is Glu or His; and Xaa at position 109 is Glu.

27. A polypeptide according to Claim 20 which is selected from

Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu

Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Ala

5   Glu Asp Val Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn

Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser

Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu

10   Pro Leu

Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp Gly

Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys Thr

15   Leu Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:66];

Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys

Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn

20   Ser Glu

Asp Met Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu

Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala

25   Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala

Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp Gly Asp

Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys

30   Thr Leu

Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:67];

Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys

35   Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu Asn Ser Glu

335

Asp Met Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
Asn Leu
Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala
Ser Ala
5 Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro
Leu Ala
Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp
Gly Asp
Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys
10 Thr Leu
Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:68];

   Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
Leu Lys
15 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
Gly Glu
Asp Gln Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro
Asn Leu
Leu Ala Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala
20 Ser Ala
Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro
Leu Ala
Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp
Gly Asp
25 Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys
Thr Leu
Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:69];

   Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
30 Leu Lys
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
Gly Glu
Asp Gln Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro
Asn Leu
35 Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala
Ser Ala

Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro
Leu Ala
Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp
Gly Asp
5   Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys
Thr Leu
Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:70];

      Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
10   Leu Lys
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
Gly Glu
Asp Gln Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro
Asn Leu
15   Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn Ala
Ser Ala
Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro
Leu Ala
Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp
20   Gly Asp
Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys
Thr Leu
Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:71];

25   Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
Leu Lys
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
Gly Glu
Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
30   Asn Leu
Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala
Ser Gly
Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro
Ser Ala
35   Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala
Gly Asp

Trp Gln Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys
Thr Leu
Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:72];

5   Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
Leu Lys
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
Gly Glu
Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
10 Asn Leu
Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala
Ser Gly
Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu Pro
Ser Ala
15 Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys Ala
Gly Asp
Trp Gln Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys
Thr Leu
Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:73];
20

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
Leu Lys
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
Gly Glu
25 Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
Asn Leu
Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala
Ser Ala
Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro
30 Leu Ala
Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp
Gly Asp
Trp Asn Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val
Thr Leu
35 Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:74];

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    Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
Leu Lys
    Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
Gly Glu
5   Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
Asn Leu
    Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala
Ser Ala
    Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro
10  Leu Ala
    Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp
Gly Asp
    Trp Asn Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val
Ser Leu
15  Glu His Ala Gln Glu Gln Gln [SEQ ID NO:75];


    Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
Leu Lys
    Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
20  Gly Glu
    Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
Asn Leu
    Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala
Ser Gly
25  Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro
Ser Ala
    Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala
Gly Asp
    Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val
30  Thr Leu
    Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:76];


    Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
Leu Lys
35  Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
Gly Glu
```

Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
Asn Leu
Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala
Ser Gly
5   Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu Pro
Ser Ala
Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys Ala
Gly Asp
Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val
10   Thr Leu
Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:77];

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
Leu Lys
15 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
Gly Glu
Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
Asn Leu
Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala
20 Ser Gly
Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu Pro
Ser Ala
Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys Ala
Gly Asp
25 Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val
Ser Leu
Glu His Ala Gln Glu Gln Gln [SEQ ID NO:78];

Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
30 Leu Lys
Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn
Ala Glu
Asp Val Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro
Asn Leu
35 Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala
Ser Ala

Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro
Leu Ala
Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp
Gly Asp
5   Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys
Thr Leu
Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:79];

     Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
10   Leu Lys
Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn
Ser Glu
Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro
Asn Leu
15   Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn Ala
Ser Ala
Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro
Leu Ala
Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp
20   Gly Asp
Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys
Thr Leu
Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:80];

25   Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
Leu Lys
Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu Asn
Ser Glu
Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro
30   Asn Leu
Leu Ala Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala
Ser Ala
Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro
Leu Ala
35   Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp
Gly Asp

Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys
Thr Leu
Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:81];

5   Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr
His Leu
Lys Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu
Asn Gly
Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg
10   Pro Asn
Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn
Ala Ser
Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
Pro Ser
15   Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys
Ala Gly
Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Thr
Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:82];

20
Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr
His Leu
Lys Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu
Asn Gly
25   Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg
Pro Asn
Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn
Ala Ser
Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu
30   Pro Ser
Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys
Ala Gly
Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Thr
35   Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:83];

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr
His Leu
Lys Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu
Asn Gly
5   Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg
Pro Asn
Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn
Ala Ser
Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu
10 Pro Ser
Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys
Ala Gly
Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Ser
15 Leu Glu His Ala Gln Glu Gln Gln [SEQ ID NO:84];

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu
Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
20 Asn Ala
Glu Asp Val Asp Ile Leu Met Glu Arg Asn Leu Arg Leu
Pro Asn
Leu Glu Ser Phe Val Arg Ala·Val Lys Asn Leu Glu Asn
Ala Ser
25 Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu
Pro Leu
Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys
Asp Gly
Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu
30 Lys Thr
Leu Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:85];

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu
35 Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu
Asn Ser

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      Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr
      Pro Asn
      Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn
      Ala Ser
 5    Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu
      Pro Leu
      Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys
      Asp Gly
      Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu
10    Lys Thr
      Leu Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:86];


      Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
      His Leu
15    Lys Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu
      Asn Ser
      Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Leu
      Pro Asn
      Leu Leu Ala Phe Val Arg Ala Val Lys Asn Leu Glu Asn
20    Ala Ser
      Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu
      Pro Leu
      Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys
      Asp Gly
25    Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu
      Lys Thr
      Leu Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:87];


      Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
30    His Leu
      Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
      Asn Ala
      Glu Asp Val Asp Ile Leu Met Glu Arg Asn Leu Arg Leu
      Pro Asn
35    Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
      Ala Ser
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Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
Pro Ser
Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys
Ala Gly
5   Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Thr
Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:88];

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
10 His Leu
Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu
Asn Ser
Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr
Pro Asn
15 Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn
Ala Ser
Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
Pro Ser
Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys
20 Ala Gly
Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Thr
Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:89];

25 Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu
Lys Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu
Asn Ser
Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Leu
30 Pro Asn
Leu Leu Ala Phe Val Arg Ala Val Lys Asn Leu Glu Asn
Ala Ser
Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
Pro Ser
35 Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys
Ala Gly

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    Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
    Val Thr
    Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:90];


 5  Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
    His Leu
    Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
    Asn Ala
    Glu Asp Val Asp Ile Leu Met Glu Arg Asn Leu Arg Leu
10  Pro Asn
    Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
    Ala Ser
    Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu
    Pro Ser
15  Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys
    Ala Gly
    Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
    Val Thr
    Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:91];
20
    Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
    His Leu
    Lys Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu
    Asn Ser
25  Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Leu
    Pro Asn
    Leu Leu Ala Phe Val Arg Ala Val Lys Asn Leu Glu Asn
    Ala Ser
    Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu
30  Pro Ser
    Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys
    Ala Gly
    Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
    Val Thr
35  Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:92];
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Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu
Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu
Asn Ser
5   Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr
Pro Asn
Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn
Ala Ser
Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu
10 Pro Ser
Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys
Ala Gly
Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Ser
15 Leu Glu His Ala Gln Glu Gln Gln [SEQ ID NO:93];

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu
Lys Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu
20 Asn Ser
Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Leu
Pro Asn
Leu Leu Ala Phe Val Arg Ala Val Lys Asn Leu Glu Asn
Ala Ser
25 Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu
Pro Ser
Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys
Ala Gly
Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
30 Val Ser
Leu Glu His Ala Gln Glu Gln Gln [SEQ ID NO:94];

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu
35 Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu
Asn Ser

Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr
Pro Asn

Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn
Ala Ser

5 Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu
Pro Ser

Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys
Ala Gly

Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
10 Val Thr

Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:95]; and

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu

15 Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
Asn Ala

Glu Asp Val Asp Ile Leu Met Glu Arg Asn Leu Arg Leu
Pro Asn

Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
20 Ala Ser

Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu
Pro Ser

Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys
Ala Gly

25 Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Ser

Leu Glu His Ala Gln Glu Gln Gln [SEQ ID NO:96].

30 Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu

Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
Asn Ala

35

Glu Asp Val Asp Ile Leu Met Asp Arg Asn Leu Arg Leu
Ser Asn

Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
40 Ala Ser

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      Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
      Pro Ser

 5    Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys
      Ala Gly

      Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
      Val Thr
10
      Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO.: 296]

      Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ala Ile His
      His Leu
15
      Lys Arg Pro Pro Ala Pro Ser Leu Asp Pro Asn Asn Leu
      Asn Asp

      Glu Asp Met Ser Ile Leu Met Glu Arg Asn Leu Arg Leu
20    Pro Asn

      Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
      Ala Ser

25    Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
      Pro Ser

      Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys
      Ala Gly
30
      Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
      Val Thr

      Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO.: 300]
35


      Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
      His Leu
40
      Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
      Asn Asp

      Glu Asp Met Ser Ile Leu Met Glu Arg Asn Leu Arg Leu
45    Pro Asn

      Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
      Ala Ser

50    Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
```

Pro Ser

Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys
Ala Gly
5
Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Thr

Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO.: 301]
10
Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu

Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
15 Asn Ala

Glu Asp Val Asp Ile Leu Met Asp Arg Asn Leu Arg Leu
Pro Asn

20 Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
Ala Ser

Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
Pro Ser
25
Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys
Ala Gly

Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
30 Val Thr

Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO.: 308]

35 Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu

Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
Asn Asp
40
Glu Asp Val Ser Ile Leu Met Glu Arg Asn Leu Arg Leu
Pro Asn

Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
45 Ala Ser

Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
Pro Ser

50 Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys

350

Ala Gly

Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Thr
5
Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO.: 309]

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
10 His Leu

Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
Asn Asp
15 Glu Asp Met Ser Ile Leu Met Glu Arg Asn Leu Arg Leu
Pro Asn

Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
Ala Ser
20
Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
Pro Ser

Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys
25 Ala Gly

Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Thr

30 Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO.: 310]

Met Ala Tyr Pro Glu Thr Asp Tyr Lys Asp Asp Asp Asp
Lys Asn

35 Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
Arg Pro

Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Ala Glu
Asp Val
40
Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu
Glu Ser

Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly
45 Ile Glu

Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala
Thr Ala

50 Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp

351

Trp Gln

Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu
Glu Gln

5

Ala Gln Glu Gln Gln [SEQ ID NO.: 315]

Met Ala Tyr Pro Glu Thr Asp Tyr Lys Asp Asp Asp Asp
10   Lys Asn

Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
Arg Pro

15   Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Glu
Asp Met

Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu
Leu Ala

20

Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly
Ile Glu

Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala
25   Thr Ala

Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp
Trp Gln

30   Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu
Glu Gln

Ala Gln Glu Gln Gln [SEQ ID NO.: 316]

35   Met Ala Asn Cys Ser Ile Met Ile Asp Glu Leu Ile His
His Leu

Lys Ile Pro Pro Asn Pro Ser Leu Asp Ser Ala Asn Leu
Asn Ser

40

Glu Asp Val Ser Ile Leu Met Glu Arg Asn Leu Arg Thr
Pro Asn

Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn
45   Ala Ser

Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
Pro Ser

50   Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys

Ala Gly

Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Thr

5

Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO.: 318]

28. A pharmaceutical composition for the
treatment of hematopoietic cell deficiencies
10   comprising a therapeutically effective amount of a
mutant human interleukin-3 polypeptide selected from
the group consisting of a polypeptide of claim 1, a
polypeptide of claim 2, a polypeptide of claim 3, a
polypeptide of claim 4, a polypeptide of claim 5, a
15   polypeptide of claim 6, a polypeptide of claim 7, a
polypeptide of claim 8, a polypeptide of claim 9, a
polypeptide of claim 10, a polypeptide of claim 11, a
polypeptide of claim 12, a polypeptide of claim 13, a
polypeptide of claim 14, a polypeptide of claim 15, a
20   polypeptide of claim 16, a polypeptide of claim 17; a
polypeptide of claim 18, a polypeptide of claim 19, a
polypeptide of claim 20, a polypeptide of claim 21, a
polypeptide of claim 22, a polypeptide of claim 23, a
polypeptide of claim 24, a polypeptide of claim 25, a
25   polypeptide of claim 26 and a polypeptide of claim 27,
and a pharmaceutically acceptable carrier.

29.   A pharmaceutical composition according
30   to Claim 28 for the treatment of hematopoietic cell
deficiencies comprising a therapeutically effective
amount of a polypeptide having an amino acid sequence
corresponding to SEQ ID NO:88 and a pharmaceutically
acceptable carrier.
35
30.   A pharmaceutical composition according
to Claim 28 for the treatment of hematopoietic cell
deficiencies comprising a therapeutically effective

amount of a polypeptide having an amino acid sequence corresponding to SEQ ID NO:89 and a pharmaceutically acceptable carrier.

5   31.   A pharmaceutical composition according to Claim 28 for the treatment of hematopoietic cell deficiencies comprising a therapeutically effective amount of a polypeptide having an amino acid sequence corresponding to SEQ ID NO:90 and a pharmaceutically
10   acceptable carrier.

       32.   A pharmaceutical composition according to Claim 28 for the treatment of hematopoietic cell deficiencies comprising a therapeutically effective
15   amount of a polypeptide selected from the group consisting of

       a polypeptide having an amino acid sequence corresponding to SEQ ID NO:66;

20

       a polypeptide having an amino acid sequence corresponding to SEQ ID NO:67;

       a polypeptide having an amino acid sequence corresponding
25   to SEQ ID NO:68;

       a polypeptide having an amino acid sequence corresponding to SEQ ID NO:69;

30   a polypeptide having an amino acid sequence corresponding to SEQ ID NO:70;

       a polypeptide having an amino acid sequence corresponding to SEQ ID NO:71;

35

       a polypeptide having an amino acid sequence corresponding

354

to SEQ ID NO:72;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:73;

5

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:74;

a polypeptide having an amino acid sequence corresponding
10   to SEQ ID NO:75;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:76;

15   a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:77;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:78;
20

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:79;

a polypeptide having an amino acid sequence corresponding
25   to SEQ ID NO:80;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:81;

30   a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:82;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:83;
35

a polypeptide having an amino acid sequence corresponding

355

to SEQ ID NO:84;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:85;

5

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:86;

a polypeptide having an amino acid sequence corresponding
10   to SEQ ID NO:87;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:91;

15   a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:92;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:93;

20

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:94;

a polypeptide having an amino acid sequence corresponding
25   to SEQ ID NO:95;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:96;

30   a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:258;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:259;

35

a polypeptide having an amino acid sequence corresponding

to SEQ ID NO:260;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:261;

5

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:262;

a polypeptide having an amino acid sequence corresponding
10   to SEQ ID NO:263;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:278;

15   a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:279;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:314;

20

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:315;

a polypeptide having an amino acid sequence corresponding
25   to SEQ ID NO:316;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:264;

30   a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:265;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:266;

35

a polypeptide having an amino acid sequence corresponding

to SEQ ID NO:267;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:268;

5

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:269;

a polypeptide having an amino acid sequence corresponding
10   to SEQ ID NO:270;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:271;

15   a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:272;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:273;

20

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:274;

a polypeptide having an amino acid sequence corresponding
25   to SEQ ID NO:275;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:276;

30

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:277;

a polypeptide having an amino acid sequence corresponding
35   to SEQ ID NO:280;

358

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:281;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:282;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:283;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:284;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:285;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:286;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:287;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:288;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:289;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:299;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:300;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:301;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:302;

5   a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:303;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:304;

10

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:305;

a polypeptide having an amino acid sequence corresponding
15   to SEQ ID NO:306;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:307;

20   a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:308;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:309;

25

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:310;

a polypeptide having an amino acid sequence corresponding
30   to SEQ ID NO:311;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:312;

35

a polypeptide having an amino acid sequence corresponding

to SEQ ID NO:313;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:314;

5

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:317;

a polypeptide having an amino acid sequence corresponding
10   to SEQ ID NO:318;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:319;

15   a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:320;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:321;

20

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:322;

a polypeptide having an amino acid sequence corresponding
25   to SEQ ID NO:323;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:324;

30   a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:325;

a polypeptide having an amino acid sequence corresponding
35   to SEQ ID NO:326;

and a pharmaceutically acceptable carrier.

33.   A method of stimulating the production
of hematopoietic cells which comprises administering a

5   therapeutically effective amount of a mutant human
interleukin-3 polypeptide selected from the group consisting of a
polypeptide of claim 1, a polypeptide of claim 2, a polypeptide
of claim 3, a polypeptide of claim 4, a polypeptide of claim 5, a
polypeptide of claim 6, a polypeptide of claim 7, a polypeptide

10   of claim 8, a polypeptide of claim 9, a polypeptide of claim 10,
a polypeptide of claim 11, a polypeptide of claim 12, a
polypeptide of claim 13, a polypeptide of claim 14, a polypeptide
of claim 15, a polypeptide of claim 16, a polypeptide of claim
17; a polypeptide of claim 18, a polypeptide of claim 19, a

15   polypeptide of claim 20, a polypeptide of claim 21, a polypeptide
of claim 22, a polypeptide of claim 23, a polypeptide of claim
24, a polypeptide of claim 25, a polypeptide of claim 26, a
polypeptide of claim 27, to a patient in need of such
treatment.

20

34.   A method according to claim 33 of
stimulating the production of hematopoietic cells
which comprises administering a therapeutically
effective amount of a polypeptide having an amino acid

25   sequence corresponding to SEQ ID NO:88.

35.   A method according to claim 33 of
stimulating the production of hematopoietic cells
which comprises administering a therapeutically

30   effective amount of a polypeptide having an amino acid
sequence corresponding to SEQ ID NO:89.

36.   A method according to claim 33 of
stimulating the production of hematopoietic cells

35   which comprises administering a therapeutically
effective amount of a polypeptide having an amino acid

sequence corresponding to SEQ ID NO:90.

37. A method according to claim 33 of
stimulating the production of hematopoietic cells
which comprises administering a therapeutically
effective amount of a polypeptide selected from the
group consisting of

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:66;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:67;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:68;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:69;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:70;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:71;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:72;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:73;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:74;

a polypeptide having an amino acid sequence corresponding

to SEQ ID NO:75;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:76;

5

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:77;

a polypeptide having an amino acid sequence corresponding
10   to SEQ ID NO:78;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:79;

15   a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:80;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:81;

20

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:82;

a polypeptide having an amino acid sequence corresponding
25   to SEQ ID NO:83;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:84;

30   a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:85;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:86;

35

a polypeptide having an amino acid sequence corresponding

to SEQ ID NO:87;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:91;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:92;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:93;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:94;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:95;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:96;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:258;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:259;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:260;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:261;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:262;

a polypeptide having an amino acid sequence corresponding

to SEQ ID NO:263;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:278;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:279;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:314;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:315;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:316;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:264;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:265;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:266;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:267;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:268;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:269;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:270;

5   a polypeptide having an amino acid sequence corresponding to SEQ ID NO:271;

        a polypeptide having an amino acid sequence corresponding to SEQ ID NO:272;

10   a polypeptide having an amino acid sequence corresponding to SEQ ID NO:273;

        a polypeptide having an amino acid sequence corresponding to SEQ ID NO:274;

15   a polypeptide having an amino acid sequence corresponding to SEQ ID NO:275;

20   a polypeptide having an amino acid sequence corresponding to SEQ ID NO:276;

        a polypeptide having an amino acid sequence corresponding to SEQ ID NO:277;

25   a polypeptide having an amino acid sequence corresponding to SEQ ID NO:280;

        a polypeptide having an amino acid sequence corresponding to SEQ ID NO:281;

30   a polypeptide having an amino acid sequence corresponding to SEQ ID NO:282;

35   a polypeptide having an amino acid sequence corresponding to SEQ ID NO:283;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:284;

5

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:285;

a polypeptide having an amino acid sequence corresponding
10   to SEQ ID NO:286;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:287;

15   a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:288;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:289;
20

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:299;

a polypeptide having an amino acid sequence corresponding
25   to SEQ ID NO:300;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:301;

30   a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:302;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:303;
35

a polypeptide having an amino acid sequence corresponding

to SEQ ID NO:304;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:305;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:306;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:307;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:308;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:309;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:310;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:311;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:312;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:313;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:314;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:317;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:318;

a polypeptide having an amino acid sequence corresponding
5   to SEQ ID NO:319;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:320;

10

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:321;

a polypeptide having an amino acid sequence corresponding
15   to SEQ ID NO:322;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:323;

20   a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:324;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:325;

25

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:326;

to a patient in need of such treatment.

30

38.   A recombinant DNA sequence comprising
vector DNA and a DNA that encodes a polypeptide selected
from the group consisting of a polypeptide of claim 1, a
polypeptide of claim 2, a polypeptide of claim 3, a polypeptide
35   of claim 4, a polypeptide of claim 5, a polypeptide of claim 6, a
polypeptide of claim 7, a polypeptide of claim 8, a polypeptide

of claim 9, a polypeptide of claim 10, a polypeptide of claim 11, a polypeptide of claim 12, a polypeptide of claim 13, a polypeptide of claim 14, a polypeptide of claim 15, a polypeptide of claim 16, a polypeptide of claim 17; a polypeptide of claim

5   18, a polypeptide of claim 19, a polypeptide of claim 20, a polypeptide of claim 21, a polypeptide of claim 22, a polypeptide of claim 23, a polypeptide of claim 24, a polypeptide of claim 25, a polypeptide of claim 26, or a polypeptide of claim 27,.

10   39. A recombinant DNA sequence according to Claim 38 comprising vector DNA and a DNA having a nucleotide sequence corresponding to SEQ ID NO:97.

          40. A recombinant DNA sequence according to

15   Claim 38 comprising vector DNA and a DNA having a nucleotide sequence corresponding to SEQ ID NO:100 or 103.   .

          41. A recombinant DNA sequence according to

20   Claim 38 comprising vector DNA and a DNA having a nucleotide sequence corresponding to SEQ ID NO:161.

          42. A recombinant DNA sequence according to Claim 38 comprising vector DNA and a DNA selected from

25

       a DNA having a nucleotide sequence corresponding to SEQ ID NO:98;

       a DNA having a nucleotide sequence corresponding to SEQ ID

30   NO:99;

       a DNA having a nucleotide sequence corresponding to SEQ ID NO:101;

35   a DNA having a nucleotide sequence corresponding to SEQ ID NO:102;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:104;

5   a DNA having a nucleotide sequence corresponding to SEQ ID NO:105;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:106;

10

a DNA having a nucleotide sequence corresponding to SEQ ID NO:107;

15   a DNA having a nucleotide sequence corresponding to SEQ ID NO:108;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:109;

20

a DNA having a nucleotide sequence corresponding to SEQ ID NO:110;

a DNA having a nucleotide sequence corresponding to SEQ ID
25   NO:111;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:112;

30   a DNA having a nucleotide sequence corresponding to SEQ ID NO:113;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:114;

35

a DNA having a nucleotide sequence corresponding to SEQ ID

NO:115;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:116;

5

a DNA having a nucleotide sequence corresponding to SEQ ID NO:117;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:118;

10

a DNA having a nucleotide sequence corresponding to SEQ ID NO:119;

15

a DNA having a nucleotide sequence corresponding to SEQ ID NO:120;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:121;

20

a DNA having a nucleotide sequence corresponding to SEQ ID NO:122;

25   a DNA having a nucleotide sequence corresponding to SEQ ID NO:123;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:124;

30

a DNA having a nucleotide sequence corresponding to SEQ ID NO:125;

a DNA having a nucleotide sequence corresponding to SEQ ID

35   NO:126;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:127;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:160;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:161;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:398;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:399;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:346;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:347

a DNA having a nucleotide sequence corresponding to SEQ ID NO:303

a DNA having a nucleotide sequence corresponding to SEQ ID NO:404

a DNA having a nucleotide sequence corresponding to SEQ ID NO:405

a DNA having a nucleotide sequence corresponding to SEQ ID NO:332

a DNA having a nucleotide sequence corresponding to SEQ ID NO:333

374

a DNA having a nucleotide sequence corresponding to SEQ ID NO:334

5   a DNA having a nucleotide sequence corresponding to SEQ ID NO:335

a DNA having a nucleotide sequence corresponding to SEQ ID NO:336

10

a DNA having a nucleotide sequence corresponding to SEQ ID NO:337

15   a DNA having a nucleotide sequence corresponding to SEQ ID NO:338

a DNA having a nucleotide sequence corresponding to SEQ ID NO:339

20

a DNA having a nucleotide sequence corresponding to SEQ ID NO:340

a DNA having a nucleotide sequence corresponding to SEQ ID
25   NO:341

a DNA having a nucleotide sequence corresponding to SEQ ID NO:342

30   a DNA having a nucleotide sequence corresponding to SEQ ID NO:343

a DNA having a nucleotide sequence corresponding to SEQ ID NO:344

35

a DNA having a nucleotide sequence corresponding to SEQ ID

375

NO:345

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:348

5

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:349

a DNA having a nucleotide sequence corresponding to SEQ ID
10 NO:350

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:352

15

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:353

a DNA having a nucleotide sequence corresponding to SEQ ID
20 NO:354

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:355

25 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:356

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:357

30

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:358

a DNA having a nucleotide sequence corresponding to SEQ ID
35 NO:359

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:360

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:361

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:362

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:363

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:364

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:365

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:366

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:367

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:368

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:369

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:370

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:371

a DNA having a nucleotide sequence corresponding to SEQ ID NO:372

5   a DNA having a nucleotide sequence corresponding to SEQ ID NO:373

a DNA having a nucleotide sequence corresponding to SEQ ID NO:374

10   a DNA having a nucleotide sequence corresponding to SEQ ID NO:375

a DNA having a nucleotide sequence corresponding to SEQ ID NO:376

15

a DNA having a nucleotide sequence corresponding to SEQ ID NO:377

20   a DNA having a nucleotide sequence corresponding to SEQ ID NO:378

a DNA having a nucleotide sequence corresponding to SEQ ID NO:379

25

a DNA having a nucleotide sequence corresponding to SEQ ID NO:380

30   a DNA having a nucleotide sequence corresponding to SEQ ID NO:381

a DNA having a nucleotide sequence corresponding to SEQ ID NO:382

35

a DNA having a nucleotide sequence corresponding to SEQ ID

NO:384

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:385

5

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:386

a DNA having a nucleotide sequence corresponding to SEQ ID
10   NO:387

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:388

15   a DNA having a nucleotide sequence corresponding to SEQ ID
NO:389

a DNA having a nucleotide sequence corresponding to SEQ ID
20   NO:390

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:391

25   a DNA having a nucleotide sequence corresponding to SEQ ID
NO:392

43.   A host cell containing a recombinant
30   DNA sequence of claim 38 and capable of expressing the
encoded polypeptide.

44.   A host cell of claim 43 containing a
recombinant DNA vector comprising vector DNA and a DNA
35   having a nucleotide sequence corresponding to SEQ ID
NO:97 and capable of expressing the encoded

polypeptide.

45.   A host cell of claim 43 containing a
recombinant DNA vector comprising vector DNA and a DNA
5   having a nucleotide sequence corresponding to SEQ ID
NO:100 or 103 and capable of expressing the encoded
polypeptide.

46.   A host cell of claim 43 containing a
10   recombinant DNA vector comprising vector DNA and a DNA
having a nucleotide sequence corresponding to SEQ ID
NO:161 and capable of expressing the encoded
polypeptide.

15   47.   A method of producing a mutant human
interleukin-3 polypeptide comprising the steps of:

        (a) culturing a host cell containing a
        recombinant DNA sequence comprising vector DNA
20   and a DNA sequence of Claim 38 and capable of
        expressing the encoded polypeptide under
        conditions permitting expression of the
        recombinant DNA; and

25   (b) harvesting the polypeptide from the culture.

        48.   A method according to Claim 47 of
producing a mutant human interleukin-3 polypeptide
comprising the steps of:
30
        (a) culturing a host cell containing a
        recombinant DNA sequence comprising vector DNA
        and a DNA having a nucleotide sequence
        corresponding to SEQ ID NO:97 and capable of
35   expressing the encoded polypeptide under
        conditions permitting expression of the

recombinant DNA; and

(b) harvesting the polypeptide from the culture.

5   49. A method according to Claim 47 of producing a mutant human interleukin-3 polypeptide comprising the steps of:

(a) culturing a host cell containing a
10 recombinant DNA sequence comprising vector DNA and a DNA having a nucleotide sequence corresponding to SEQ ID NO:100 or 103 and capable of expressing the encoded polypeptide under conditions permitting expression of the
15 recombinant DNA; and

(b) harvesting the polypeptide from the culture.

     50. A method according to Claim 47 of
20 producing a mutant human interleukin-3 polypeptide comprising the steps of:

(a) culturing a host cell containing a recombinant DNA sequence comprising vector DNA
25 and a DNA having a nucleotide sequence corresponding to SEQ ID NO:161 and capable of expressing the encoded polypeptide under conditions permitting expression of the recombinant DNA; and
30
(b) harvesting the polypeptide from the culture.

     51. A vector containing a gene having a DNA sequence selected from the group consisting of:
35
a DNA having a nucleotide sequence corresponding

to SEQ ID NO:97;

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:100;

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:103;

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:160;

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:161;

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:404;

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:405;

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:364;

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:368;

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:369;

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:376;

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:377;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:378;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:385;

52. A recombinant DNA vector comprising a promoter, a ribosome binding site, and a signal peptide directly linked to a DNA sequence encoding a polypeptide selected from the group consisting of

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:88;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:89; and

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:90;

said vector being capable of directing expression of said mutant human interleukin-3 polypeptide.

53. A recombinant DNA vector according to Claim 51 wherein the promoter is AraBAD.

54. A recombinant DNA vector according to Claim 51 wherein the ribosome binding site is g10-L.

55. A recombinant DNA vector according to Claim 51 wherein the signal peptide is a lamB signal peptide.

56. A recombinant DNA vector according to

Claim 51 wherein the signal peptide is the lamB signal peptide depicted in Figure 8.

5   57.   A recombinant DNA vector according to Claim 51 wherein the promoter is AraBAD and the ribosome binding site is g10-L.

          58.   A recombinant DNA vector according to
10   Claim 51 wherein the promoter is AraBAD, the ribosome binding site is g10-L, and the signal peptide is a lamB signal peptide.

          59.   A recombinant DNA vector according to
15   Claim 51 wherein the promoter is AraBAD, the ribosome binding site is g10-L, and the signal peptide is the lamB signal peptide depicted in Figure 8.

          60.   A recombinant bacterial host which
20   comprises the vector of Claim 51 wherein said host secretes a mutant human interleukin-3 polypeptide selected from the group consisting of
       a polypeptide having an amino acid sequence
       corresponding to SEQ ID NO:88;
25
       a polypeptide having an amino acid sequence
       corresponding to SEQ ID NO:89; and

       a polypeptide having an amino acid sequence
30   corresponding to SEQ ID NO:90.

          61.   A polypeptide of the formula
            1   5   10
(Met)$_m$-Ala Pro Met Thr Gln Thr Thr Ser Leu Lys Thr
35
            15   20

```
      Ser Trp Val Asn Cys Ser Xaa Met Ile Asp Glu Ile Ile
      25                  30              35
      Xaa His Leu Lys Xaa Pro Pro Xaa Pro Leu Leu Asp Xaa
              40              45                  50
 5    Asn Asn Leu Asn Xaa Glu Asp Xaa Asp Ile Leu Met Glu
                      55                  60
      Xaa Asn Leu Arg Xaa Pro Asn Leu Xaa Xaa Phe Xaa Arg
          65                  70                  75
      Ala Val Lys Xaa Leu Xaa Asn Ala Ser Xaa Ile Glu Xaa
10                80                  85
      Ile Leu Xaa Asn Leu Xaa Pro Cys Leu Pro Xaa Ala Thr
      90                  95                  100
      Ala Ala Pro Xaa Arg His Pro Ile Xaa Ile Lys Xaa Gly
              105                 110                 115
15    Asp Trp Xaa Glu Phe Arg Xaa Lys Leu Thr Phe Tyr Leu
                      120                 125
      Xaa Thr Leu Glu Xaa Ala Gln Xaa Gln Gln Thr Thr Leu
          130
      Ser Leu Ala Ile Phe [SEQ ID NO:129]
20
```

wherein m is 0 or 1; Xaa at position 18 is Asn or Ile;
Xaa at position 25 is Thr or His; Xaa at position 29
is Gln, Arg, or Val; Xaa at position 32 is Leu, Ala,
or Asn; Xaa at position 37 is Phe, Pro, or Ser; Xaa at
25   position 42 is Glu, Ala, or Ser; Xaa at position 45 is
Gln, Val, or Met; Xaa at position 51 is Asn or Arg;
Xaa at position 55 is Arg, Leu, or Thr; Xaa at
position 59 is Glu or Leu; Xaa at position 60 is Ala
or Ser; Xaa at position 62 is Asn or Val; Xaa at
30   position 67 is Ser, Asn, or His; Xaa at position 69 is
Gln or Glu; Xaa at position 73 is Ala or Gly; Xaa at
position 76 is Ser or Ala; Xaa at position 79 is Lys
or Arg; Xaa at position 82 is Leu, Glu, or Val; Xaa at
position 87 is Leu or Ser; Xaa at position 93 is Pro
35   or Ser; Xaa at position 98 is His, Ile, or Thr; Xaa at
position 101 is Asp or Ala; Xaa at position 105 is Asn

or Glu; Xaa at position 109 is Arg or Glu; Xaa at position 116 is Lys or Val; Xaa at position 120 is Asn, Gln, or His; Xaa at position 123 is Ala or Glu; with the proviso that from four to twenty-seven of the amino acids designated by Xaa are different from the corresponding amino acids of native human interleukin-3 and wherein from 1 to 14 of amino acids 1 to 14 has been deleted from the N-terminus and/or from 1 to 15 of amino acids 119 to 133 has been deleted from the C-terminus of the polypeptide; or a polypeptide having substantially the same structure and substantially the same biological activity.

62. A method according to Claim 47 of producing a mutant human interleukin-3 polypeptide comprising the steps of:

(a) culturing a host cell containing a recombinant DNA sequence comprising vector DNA and a DNA having a nucleotide sequence corresponding to SEQ ID NO:160 and capable of expressing the encoded polypeptide under conditions permitting expression of the recombinant DNA; and

(b) harvesting the polypeptide from the culture.

63. A method according to Claim 47 of producing a mutant human interleukin-3 polypeptide comprising the steps of:

(a) culturing a host cell containing a recombinant DNA sequence comprising vector DNA and a DNA having a nucleotide sequence corresponding to SEQ ID NO:161 and capable of expressing the encoded polypeptide under

conditions permitting expression of the recombinant DNA; and

5

(b) harvesting the polypeptide from the culture.

64. A host cell containing a recombinant DNA vector comprising vector DNA and a DNA sequence selected from the group consisting of:

10

a DNA having a nucleotide sequence corresponding to SEQ ID NO:160; and

a DNA having a nucleotide sequence corresponding to SEQ ID NO:161;

15

and capable of expressing the encoded polypeptide.

65. A polypeptide according to Claim 27 which is:

20
Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu
Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser
Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr
25
Pro Asn
Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser
Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser
30
Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly
Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr
Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:89].

35

INTERLEUKIN-3 (IL-3) MULTIPLE MUTATION POLYPEPTIDES